ELECTRICAL SOUTH

JULY
1944

UNIVERSITY OF FLORIDA
Library

FANS by HUNTER-CENTURY

55th SEASON

52-In Hotel Type

24-In "Airspread" Ceiling

HUNTER, who has made fans and ventilators exclusively during 55 years, is now operating under War Production Board restrictions. • No more fans will be made except for the Army, Navy and Maritime Commission. HUNTER unfilled orders now on hand represent contracts with Government Agencies. • Certain sizes of belted exhaust types can be made available for Government hospitals and other war industries, subject to limited material inventories now on hand.

HUNTER FAN & VENTILATING COMPANY, INC.

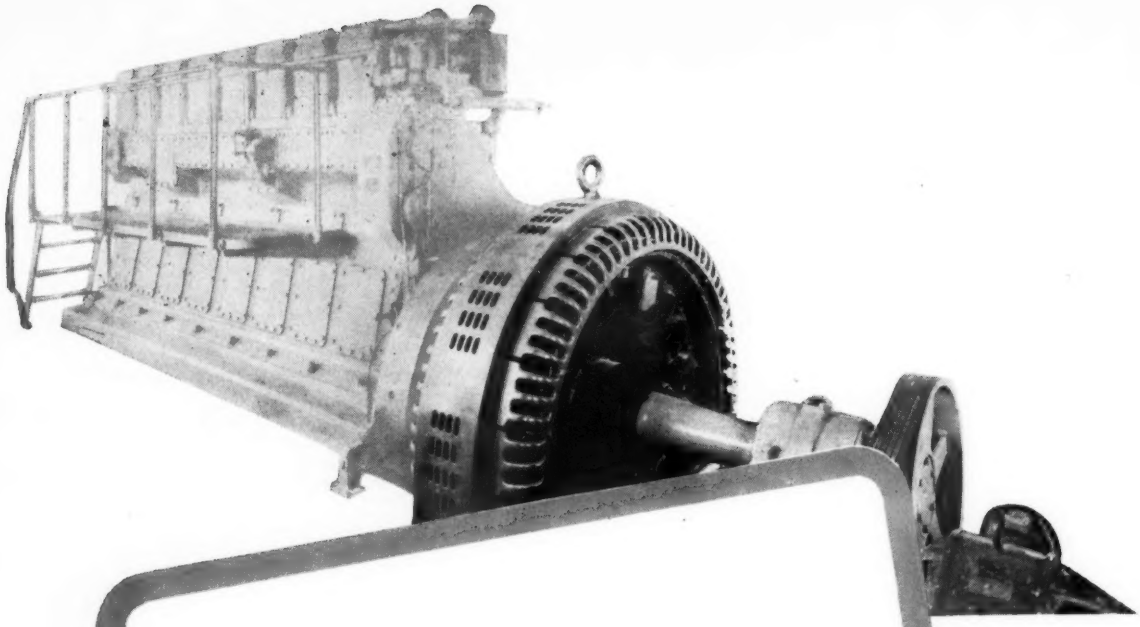
Factory: FULTON, N. Y.

General Sales Offices: Memphis, Sterick Bldg. *Eastern Sales Office*: New York, 92 Warren Street *Western Sales Office*: St. Louis, 1706 Olive Street

Sales Offices:
ATLANTA
CHICAGO
DALLAS
HOUSTON
LOS ANGELES
PHILADELPHIA

Zephair Comfort Cooling and Commercial Ventilators

Sales Offices:
BOSTON
CLEVELAND
DETROIT
KANSAS CITY
NEW ORLEANS
PITTSBURGH



SPECIFY WESTINGHOUSE

. . . get *undivided responsibility* for the complete electrical installation

Complete Electrical Equipment for Diesel Power Plants

Westinghouse also supplies exciters, voltage regulators, switchboards, circuit breakers, transformers, auxiliary equipment and controls — all coordinated in design for operation as a unit.

Undivided responsibility—Westinghouse assumes full responsibility for providing the *complete* electrical installation . . . speeds negotiation.

Matched performance—Regardless of make of Diesel you purchase, Westinghouse builds the generator with characteristics to match those of the engine . . . assuring stable operation and long life of the unit.

24-hour-a-day service—Provided for all of your electrical equipment from 37 strategically located Westinghouse service shops.

For more information, call nearest Westinghouse office or write for B-3028, "A-C Generators for Diesel Engine Drives." Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Dept. 7-N. J-10265J

Westinghouse A-C GENERATORS FOR DIESEL ENGINE DRIVES

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

ELECTRICAL SOUTH is published monthly by W. R. C. Smith Publishing Co., Marietta, Ga., and Atlanta, Ga., U. S. A.
Subscription rates, United States and Possessions, $1.00 for one year; Canada, $1.50 per year; Foreign Countries, $2.00 per year.
Entered as second class matter at the postoffice, Marietta, Ga., under Act of March 3, 1879
Volume 24 Number 7

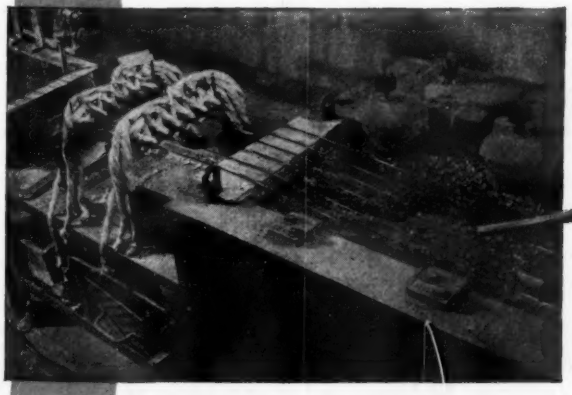
OKOLOY
was not drafted . . .
It volunteered in 1928

The war-caused shortage of tin forced many wire and cable manufacturers to search hurriedly for substitutes to replace the tin coating on conductors to prevent chemical reactions between the copper and rubber insulation.

In 1928, however, Okonite chemists, constantly discontent with run-of-the-mill practices, had developed and perfected Okoloy, a lead alloy coating that outlasts tin at least 2 to 1.

The old practice of "tinning" the copper conductors by passage through a bath of molten metal gave inadequate protection and too often led to failure and premature deterioration of expensive cables.

No war-forced substitute, Okoloy, for sixteen years, has been used to protect the copper conductors of all Okonite rubber insulated cables. When you specify any Okonite cable, Okoloy is just one of the "plus benefits" you obtain.



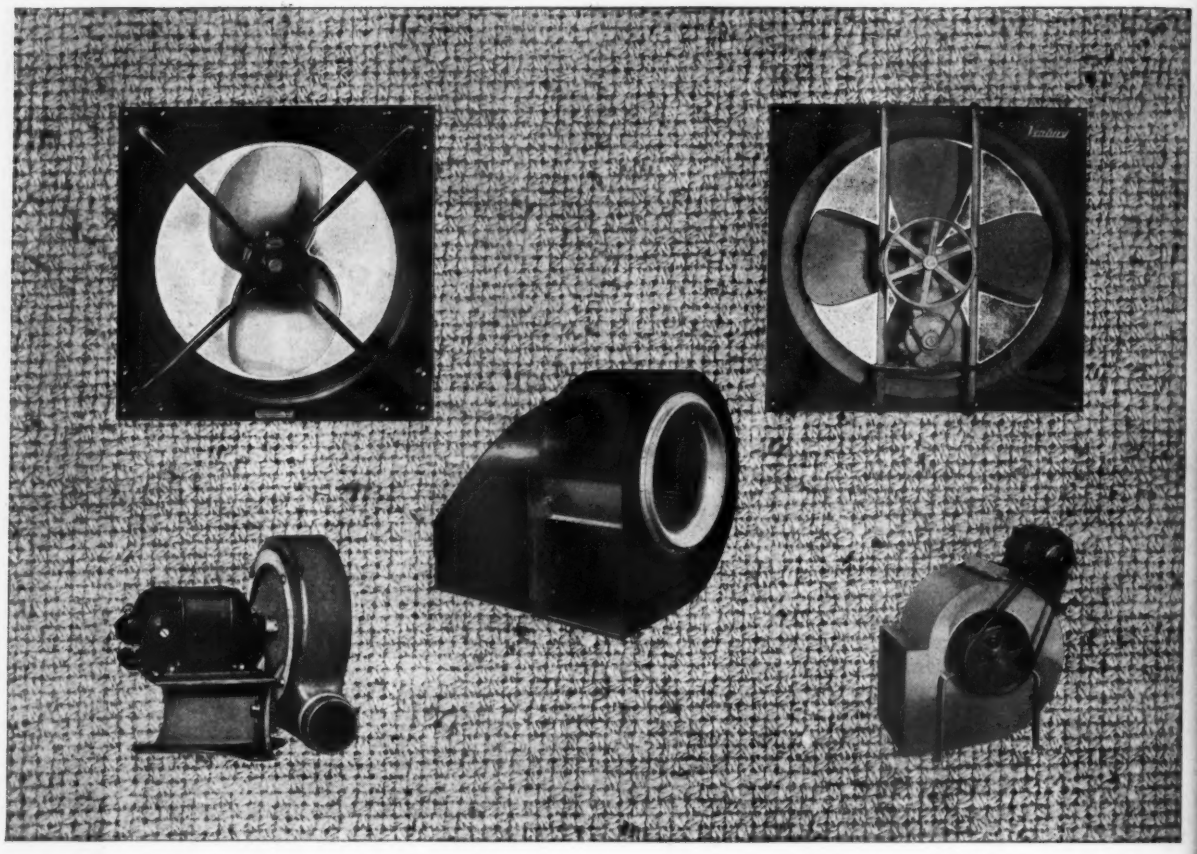
LASTING PROTECTION: After electrolytic cleaning, all Okonite copper wire passes through the Okoloy bath where, under carefully controlled temperature, the corrosion-resistant Okoloy coating is bonded to the conductor.

PROVED IN THE FIELD SINCE 1928: Section of Okoloy-coated wire removed for examination in 1941 after 13 years of service along right-of-way of a major railroad system, where it was continuously exposed to weather and to highly corrosive sulphur fumes. Note perfect condition of Okoloy coating and Okonite insulation.

THE OKONITE COMPANY, PASSAIC, NEW JERSEY

OKONITE INSULATED WIRES & CABLES

3700



Do Ventilating Contractors Perform a *VITAL WARTIME SERVICE?*

"For the want of a nail, the shoe was lost." Never before has the wisdom of this saying been so conclusively proved — By Industry? Sure. Industry has performed miracles. But we specifically refer to the tens of thousands of Ventilating Contractors and Dealers in America—those who used to sell and install ventilating fans and blowers for stores, apartments, public buildings, schools and homes.

Today, their service is a vital war task. A ventilating fan to remove dangerous fumes from a war plant . . . a pressure blower to speed the supply of badly needed drugs . . . cooling for a petroleum plant . . . and thousands of other air-handling jobs in industry.

Truly, these contractors have furnished the nail that saved the shoe. And when Victory is won, their knowledge of the ventilating and allied businesses, their skill and experience, will be reflected in better facilities and improved service in furnishing American Blower Ventilating Equipment and other products to a peaceful America.

After Victory, American Blower and its dealers and distributors will again be ready to supply good ventilation to everyone. Good ventilation is good business.

ARMY (E) NAVY
For Excellence in Production

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary corporation

AMERICAN BLOWER

HUBBARD AUTOGAPS *Rain or Shine!*

Hubbard Autogaps are absolutely unaffected by moisture. Exhaust ports are designed so that rain cannot enter. The all-important fibre valve element is also unaffected by moisture content in the air or actual wetness. Due to these planned characteristics there is no need for sealing Hubbard Autogaps and relying on the permanence of the seal.

Inquiry indicates that engineers have shown greatest interest in the elimination of moisture from lightning arresters and consequent faulty operation. Rain or shine, use Hubbard Autogaps!

HUBBARD AND COMPANY

PITTSBURGH . . . OAKLAND CALIFORNIA . . . CHICAGO

V 42 7 JUL 44 UMI

IT'S ALWAYS Wiser TO Wire Ahead
WESTERN UNION
(01)
A. N. WILLIAMS
PRESIDENT
SYMBOLS
DL = Day Letter
NL = Night Letter
LC = Deferred Cable
NLT = Cable Night Letter
Ship Radiogram
CLASS OF SERVICE
This is a full-rate Telegram or Cable-gram unless its de-ferred character is in-dicated by a suitable symbol above or pre-ceding the address.
The filing time shown in the date line on telegrams and day letters is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination
NBF 35 29-WUX-NEWYORK NY 4 442R
RE : POSTWAR BUILDING
TO : ARCHITECTS-ENGINEERS-INDUSTRIAL EXECUTIVES
ELECTRICAL WIRING IN YOUR POSTWAR PLANS
DESERVES A FULL MARGIN OF SAFETY
FOR EXPANSION — — INSURANCE AGAINST
BREAKDOWNS AND EARLY OBSOLESCENCE.
THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

PLANNING POSTWAR HOMES? A new factory? A brighter, more bustling town? You'll want to take every advantage of the wonderful electrical devices of tomorrow.

So—Wire ahead! Make sure that your electrical system can handle the greatly increased load that it will surely be asked to carry.

While you're in the advanced planning stage consult with your engineer, electrical contractor and utility power engineer. Unwired planning will cost you a lot more than planned wiring.

44363

HELP BRING VICTORY SOONER . . . BUY MORE WAR BONDS

ADEQUATE WIRING KEY TO VICTORY JOBS SERVES AND SAVES

ANACONDA

ANACONDA WIRE & CABLE COMPANY

25 Broadway, New York 4 . . . Sales Offices Principal Cities

Electrical Wires and Cables of Copper are the Life Lines of our Nation

ELECTRICAL SOUTH

VOL. 24 JULY 1944 NO. 7

T. W. McALLISTER, *Vice Pres., Editorial Director*

CARL W. EVANS, *Editor*

BARON CREAGER, *Southwestern Editor*

J. C. MARTIN, *Business Manager*

W. E. COOGLER, *Production Manager*

In This Issue

Unlimited Raceway Capacity Basis of Wiring Adequacy	7
Maintenance for Arc Welders	10
Formula for Training Appliance Repairmen	12
Training Program Turns Out Skilled Repairmen	14
Safety, Sanitation, Efficiency—In Electric Kitchen	16
Bridging the Gap with Household Furnishings	18
"Know Your Customers" is Dealer's Success Formula	19
Capacitors Release Capacity for Essential Loads	20
Connecting Induction Motor for Reduced HP Rating	21
High Temperature Insulation Reduces Motor Weights	22
Servicing Refrigerator Motor Starting Relays	23
Electronics at Work in Industry	31
News of the Electrical Industry	42
Personal Notes About Men You Know	58
New Electrical Equipment and Materials	60

Copyrighted 1944, *W. R. C. Smith Publishing Co., Atlanta, Georgia*

Member A. B. P. — A. B. C.

ANNUAL SUBSCRIPTION—$1.00

Business Representatives

L. E. ALLEN, 189 W. Madison St., Chicago, Ill. Tel. Lakeview 10282.
L. R. McCARTY, 325 Winding Way, Merion, Pa. Tel. Merion 1066.
W. A. McGEE, Post Office Box 562, Charlotte, N. C. Tel. 3-4932.

Published Monthly by
W. R. C. SMITH PUBLISHING COMPANY
Atlanta and Marietta, Georgia

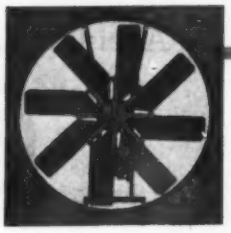
Editorial and Business Offices
Grant Building, Atlanta, Georgia

W. J. ROOKS, *President;* T. W. McALLISTER, *First Vice-President;*
E. W. O'BRIEN, *Vice-President;* RICHARD P. SMITH, *Vice-President;*
A. E. C. SMITH, *Vice-President;* J. C. COOK, *Vice-President;*
O. A. SHARPLESS, *Treasurer;* J. C. MARTIN, *Secretary;*
SEBA J. JONES, *Assistant Secretary and Treasurer.*

Publishers Also of
SOUTHERN AUTOMOTIVE JOURNAL — COTTON
SOUTHERN POWER & INDUSTRY — SOUTHERN HARDWARE

TAKE ORDERS *NOW*
for future delivery

Coolair TRADE MARK
EXHAUST FANS and BLOWERS



Active dealers and distributors are continuing to solicit customers and *sell* orders for Coolair Fans and Blowers every day . . . and shipments are being made in a reasonable length of time.

CONTACT ALL PROSPECTS NOW

- because—CMP Regulations permit almost any type of business, able to certify that the equipment they order is necessary to the successful operation of their business, to assign their own preference ratings on purchases up to $500. Form WPB 541 (Formerly PD-1A) can be filed for orders in excess of $500.
- because—many Government orders are still available to wide-awake dealers who keep in touch with these prospects.
- because—by selling your customer on an "order first—shipment first" basis, he will be assured of as prompt delivery as possible.

DON'T DELAY — START TODAY . . . contacting every likely prospect. We will be glad to help you with any priority problems that may arise. Send for a supply of the latest Coolair literature and the 1944 price list.

A full description of the Coolair line, with tables showing models, dimensions, performance data, etc., can be found in
SWEET'S CATALOG A.S.H.V.E. GUIDE
ELECTRICAL BUYER'S REFERENCE

AMERICAN COOLAIR CORPORATION . . . Manufacturers
3604 MAYFLOWER STREET
JACKSONVILLE 3, FLORIDA

Prevent Shock!

Accidental contact with live parts is impossible with these

PANELBOARDS

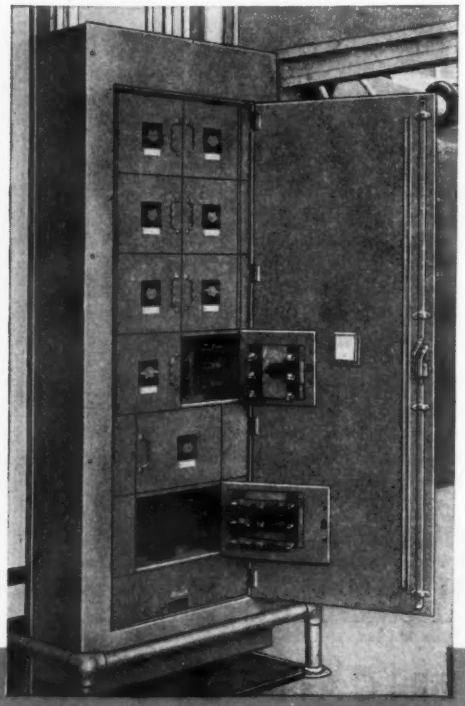
for LIGHT and POWER FEEDER DISTRIBUTION

In these panelboards, *the switch and fuse are combined in one unit* — the current is OFF when the door is open, or the fuse carrier removed. This arrangement also renders replacement of fuses safe — quick — and easy.

Both the FA Klampswitchfuz and the FA Pulfuzswitch Panelboards are assembled from standardized units. In each, the switch blades make *pressure contact* with the fixed switch parts, assuring full current-carrying capacity. This, with the silver-plated contact parts, insures low resistance to current flow, and reduces heating.

FA Solderless Type Pressure Connectors on switch units and mains, and generous wiring space, expedite connection . . . Boxes are treated to prevent rusting and trims are finished in attractive pearl gray enamel . . . Approved by Underwriters' Laboratories, Inc.

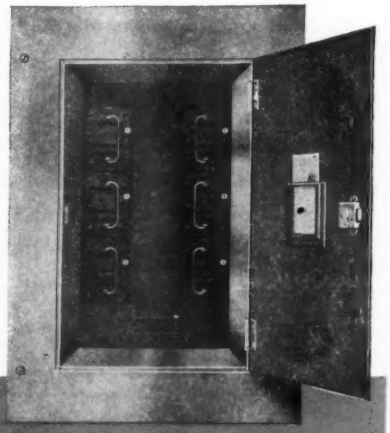
Below: A Klampswfuz Panelboard with 30, 60 and 100 Amp., 575 volt units. FA Klampswfuz capacities are 30 to 1200 Amp., 250 volt AC or DC, and 575 volt AC in 2, 3 or 4 pole types, single or double throw.



Ask the FA Sales-Engineer

how this equipment can be applied to your requirements. His long experience is at your service, without obligation. Write for the name of the one nearest you — or see listing in Sweet's, Electrical Buyers' Reference, or Thomas' Register . . . Frank Adam Electric Company, Box 357, St. Louis (3), Mo.

At right: A Pulfuzswitch type Panelboard with 60 Amp. branch circuits. FA Pulfuzswitch capacities are 30, 60 and 100 Amp., 250 volt; 30 and 60 Amp., 575 volt, 2 and 3 pole.



Frank Adam
ELECTRIC COMPANY
ST. LOUIS

ELECTRICAL SOUTH

JULY 1944

Unlimited Raceway Capacity Basis of Wiring Adequacy

By P. N. Vinther*

UNLIMITED raceway capacity is the outstanding feature of the electrical installation in the latest addition to the Dallas, Texas, skyline—the Mercantile Bank Building. This recently completed building is a thirty-story structure of modern set-back design towering 422 feet above the sidewalk. In addition to the thirty occupied stories, there are two basements and five penthouse levels.

The frame of the building is of the ordinary structural steel type assembled by a combination of riveting and welding, fireproofed in more or less the conventional manner, but there tradition ceases to control. The floor slab construction, instead of any of the familiar flat concrete slab types, consists of a cellular steel decking material covered with a fill of light aggregate concrete and topped with a thin, portland wearing surface. This cellular steel decking, which resembles nothing so much as giant corrugated cardboard such as is used in packing cases. Each cell or lengthwise compartment is a potential raceway for electrical conductors. When supplemented with the proper fittings, this arrangement provides almost unlimited capacity for electrical circuits.

The steel decking is delivered to the building site in sections two feet wide by the length necessary to span from structural support to structural support.

Each section is built up of two corrugated sheets of the necessary gauge to secure the requisite structural strength, faced together and spot welded to a single whole. One of the two sheets is slightly shorter than the other so that when the sections are placed end to end on the steel frame the meeting seam is exposed from the top. Through this gap in the top sheets the bottom sheets are welded to the structure, after which a cover plate similarly corrugated is applied to cover the gap.

These decks, when applied to the entire floor area, provide at one and the same time the load-bearing function of the floor and a form over which to apply a wearing surface. In this building the material used is such that cells occur six inches center to center and are approximately 3½ inches wide by 3 inches high, and the concrete covering is approximately 1¾ inches thick at its thinnest point.

Standard Fittings Available

To exploit the potential use of the cells as electrical raceways to the fullest, the manufacturer has developed a full line of auxiliary materials and fittings. The first need was, of course, for a means of cross communication between cells. The device for this purpose, called a "header," is a steel tube of rectangular section, approximately 6 inches wide by 1 inch high, designed to be laid crosswise to the cells, if possible, and held in place by strap sheet metal screwed to the web between cells.

At specified intervals, round holes, approximately 4 inches in diameter are punched in the ceiling of this header, extruded outward and fitted with an access fitting, which by means of adjusting screws can be brought to level and elevation flush with the finished floor. The access fitting includes a removable access plate which in the finished job looks much like the exposed top of a conventional floor outlet box and which, like the floor outlet box, can be supplied with an adapter ring to suit any floor covering.

Since it is necessary to get wiring from conventional load centers, and communications terminal cabinets into the floor system, a series of devices for this purpose have been developed. One such device is called a header or vertical ell, and is useful when the cabinet to be served is at the end of the header run. It consists of a section of flat tube the same size and shape as the header, curved to create an elbow, and when used in conjunction with sections of straight duct serves to extend the header run horizontally to the cabinet location, turn up and terminate at the cabinet. A connector is available for making the mechanical joint between duct and cabinet.

Another such device is useful when the cabinet to be served is remote from the header duct but over the cell area. It is an elbow shaped iron casting with a cast

*Mr. Vinther is a consulting engineer, of Dallas, Texas. All photographs were supplied through the courtesy of H. H. Robertson Co., Pittsburgh, Pa.

flange designed to cover a rectangular hole cut in the ceiling of a cell. When so placed and attached by means of sheet metal screws, the bottom of the elbow opens into the cell with a wide bell shaped mouth, which is threaded. The threaded top end of the elbow is connected into the cabinet with a conduit nipple.

The devices for getting conductors from supply sources into the header-cell system have no value unless their counterparts are provided to get conductors out of the header-cell system to the points of ultimate consumption. The manufacturer provides two types of such devices. One, called the flat cell connector, is designed to enable conduits to be connected to the cell system and is a simple casting, one end terminating in a square flange designed to be screwed over a rectangular opening in the ceiling of a cell and the other in a female threaded conduit opening looking in a horizontal direction.

The other device, called a service head, is a fitting designed to be installed after building completion and to constitute a convenience outlet or point of connection for communication conductors. It consists of several pieces which are installed in proper sequence as follows:

1. A hole approximately 2½" in diameter is chipped in the concrete slab to expose the center line of the cell to be tapped.

2. With a hole cutting saw, a circular hole, 1¼" in diameter, is opened in the ceiling of the cell.

3. This opening is threaded with a tool provided by the manufacturer.

4. The floor tap body is screwed into this hole to the proper depth according to the thickness of concrete cover, and locknutted in place.

5. The next piece, called a floor tap extension, is screwed into the floor tap body, leaving a male threaded end extending above the finished floor by approximately ⅜"

6. The small annular space surrounding the floor tap body is filled with plaster of paris up to the original floor line.

7. Conductors are pulled.

8. The service head of the proper type is screwed down on the extending threaded end of the floor top extension and set screwed to prevent turning off.

These are the principal fittings available and the ones most commonly used. There are additional devices such as couplings, end closures and conduit adapters, large access units designed to afford more working room at a junction point between cell and header, and greater radii of curvature for conductors being pulled and many others for special applications.

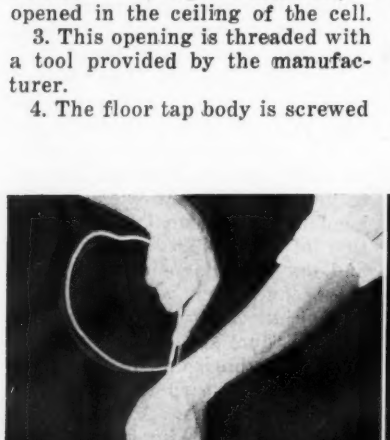
As previously stated, the floor cells occur on 6" centers and each such cell is a potential raceway. The first design decision is to determine at what frequency across the building raceways are to be provided, a decision influenced on the one hand by the frequency practically desirable, and on the other by the cost both of the initial provisions and the ultimate wiring.

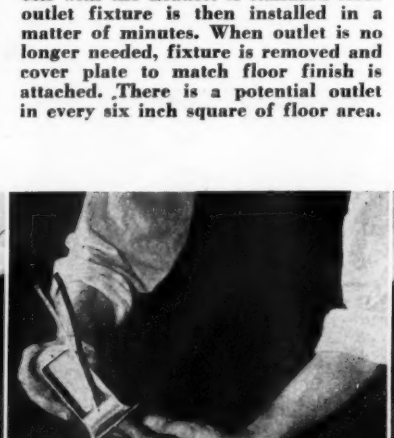
Provision for Three Systems

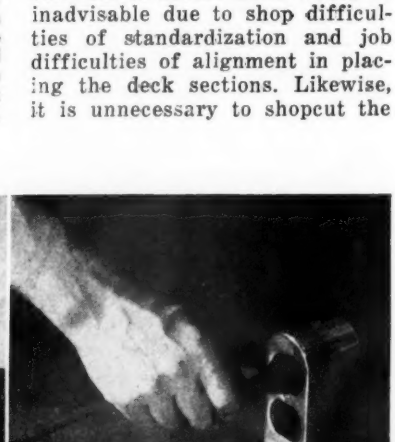
In the areas of the Mercantile Bank Building that are occupied by the bank, three separate header cell systems are provided, one for branch circuit wiring, one for telephone conductors, and one for signal wires, and each such provision is available on 18" centers; thus all cells are "live."

In the balance of the building it was felt that provision of service on 24" centers was from a practical standpoint adequate, and that two header cell systems, one for branch circuit wiring and one for communications conductors, would suffice. Consequently, in all rentable areas, two live cells alternate with two dead cells. In the banking areas, therefore, access units occur in each header on 18" centers, and in the balance of the building, on 24" centers.

The expression "live" as applied to cells does not necessarily mean that they are in use, but only that they are **available** for use. To render them useful, an additional step is necessary. It is obvious that to shopcut holes in the ceilings of all potentially live cells under access units would be inadvisable due to shop difficulties of standardization and job difficulties of alignment in placing the deck sections. Likewise, it is unnecessary to shopcut the







These pictures show the simple operations necessary to install an outlet in a building equipped with Q-Floor. A hole is drilled directly into one of the floor cells and wires are pulled through from the junction of the floor cell with the header. A standard floor outlet fixture is then installed in a matter of minutes. When outlet is no longer needed, fixture is removed and cover plate to match floor finish is attached. There is a potential outlet in every six inch square of floor area.

holes in the header duct at each access unit. Instead the cells are prepared in no manner whatever, and the header is provided only with a small centering to guide the hole-cutting saw.

When in practice it is desired to make "live" a given floor cell, the cover plate of the access plate is removed, and perfectly aligned holes are cut simultaneously through the floor of the header and the ceiling of the cell. This opening is then fitted with a thin metal grommet which is rolled into position by a tool provided for the purpose, thus electrically and mechanically bonding the two raceways together and presenting a smooth rounded edge over which to pull conductors.

In any project, then, the several steps in installing and utilizing the cellular floor idea, beginning with the construction of the structural steel frame, are to lay the deck, apply headers, connectors, conduits, etc., which are to be concealed, and pour the concrete; and following that milestone, to apply cabinets and service heads, pull wires, and connect up for service.

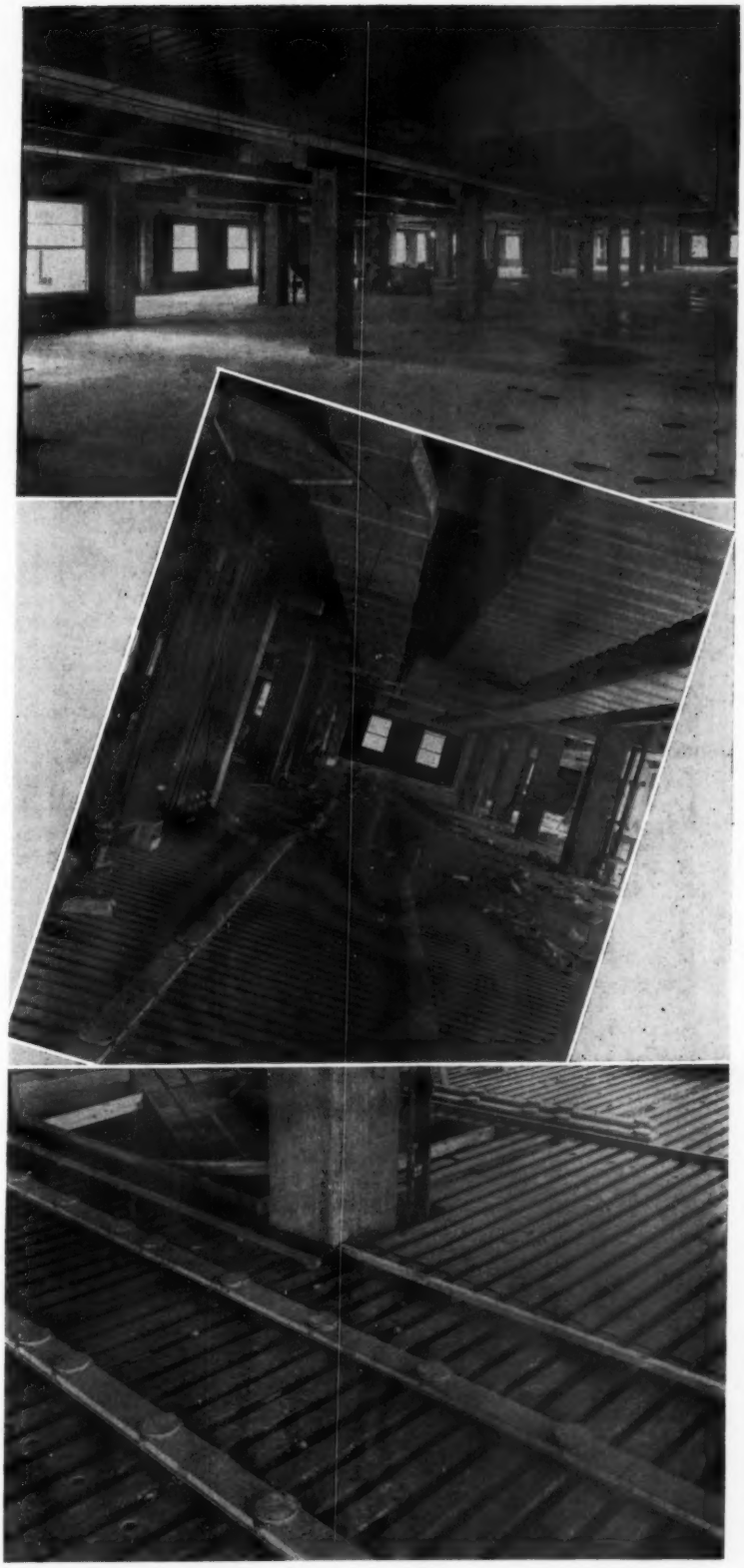
Wiring for Tenants

In this building, no walls were erected or ceilings applied until space was leased, and then it was prepared area by area in accordance with the desires and needs of the tenants. In keeping with this general scheme, no electric work was done in rentable areas prior to leasing, beyond one simple provision in each bay, which provision consisted of a conduit tap by means of a flat cell connector to an ultimately live cell, a conduit turning up to a convenience outlet in either a column or an outside wall, and a conduit continuing vertically from this convenience outlet and finally turning horizontally and terminating above the eventual ceiling level. Thus was made permanently available a raceway for branch circuit wiring from the load center to the ceiling of each bay where it could be extended into whatever scheme for illumination that was finally to be installed.

Advantages claimed for this method of construction are as follows:

1. Generally speaking, it is impossible for a tenant to designate a spot where he wishes either communication or 110 volt service

(*Continued on page 69*)



These views of the Mercantile Bank Building show Q-Floors in various stages of construction. In center, electrical headers are being placed across cells. At bottom, headers are in place. Top, floor fill laid, columns fireproofed, ducts hung from underside of Q-Floors.

Maintenance for Arc Welders

An expert in this field, who repairs most of the welders in the Southwest, offers advice on how to speed service.

By Ernest C. Gill*

THE ARC welding machine is the real "work horse" of this mechanical and electrical age. It is doubtful if any other machine is subject to more abuse, longer hours and harder work. During this war, our men and women have been taught to use these machines in a few weeks' time with emphasis on "how to use," and little information on "how to take care of" or "what to do if it quits."

We present here a few pointers that should help the repair man revive a "dead one." No attempt will be made to cover all types in the limited space available but this discussion of service for a popular make of machine should be helpful. These machines are separately excited and are made with several types of current controls.

Generally, there are only two kinds of trouble insofar as the welder is concerned. They are: (1) "It is hot and then it is cold," and (2) "it won't work at all." At first thought, that does not seem to be enough information, but to the repairman it means: (1) "Being hot and then cold," that some part or parts fail intermittently, or (2) "It won't work at all," that some part has failed completely.

There are several things that may cause failure in the first case, but they will usually boil down to just one thing. That is, high resistance electrical connections. That is a good starting point, therefore, in our service discussion.

The writer finds the best procedure is to connect a .1 or .15 ohm resistance made of nichrome strap across the output posts of the welder. This strap should be made of approximately 1/16"x3/4" material. Start the welder and turn the voltage and current control to normal welding range for average size rod, leaving the machine running for a short time. Meanwhile, make a thorough check of all joints for loose connections. This can be done with a d-c voltmeter, any defective connection causing a deflection of the meter pointer.

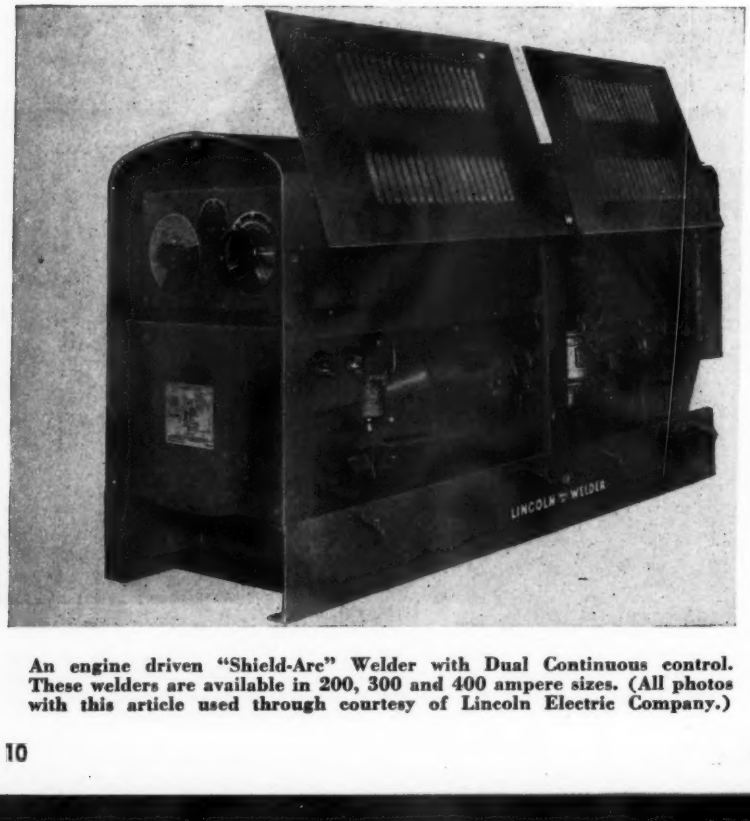
This test should not be made with a voltmeter that has a full scale reading of less than the voltage reading on welder meter, due to the fact that any completely open joint will cause the meter to give the same reading that is shown on the welding machine voltmeter, and a low reading meter may be damaged or burned out.

If the repairman does not have a voltmeter, the next best method is to feel of each connection and any joint found to be hot should be examined further as it may be the trouble maker. It should be taken apart and cleaned of any oxidation and well tightened or soldered.

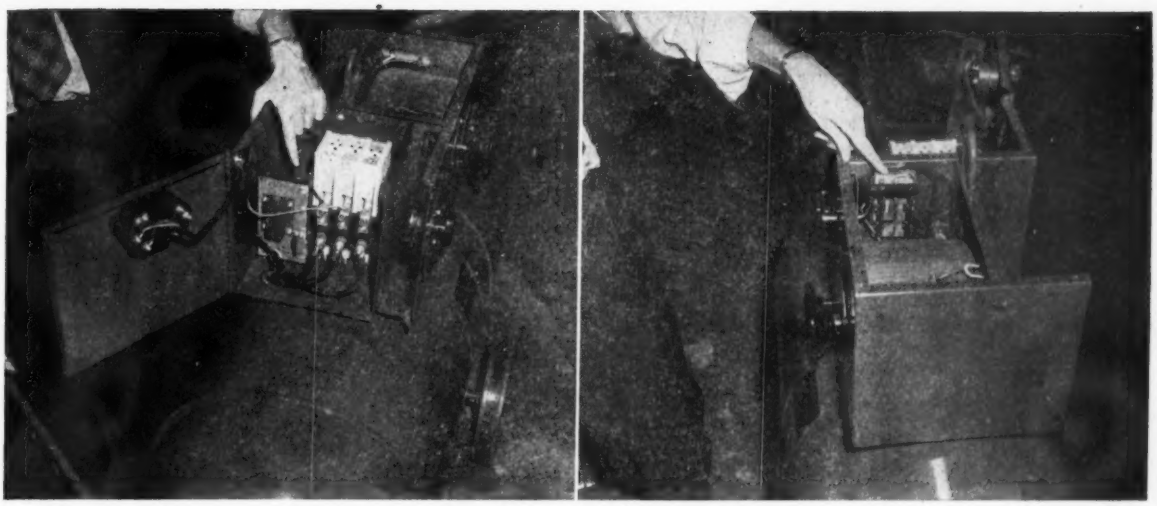
If the nichrome resistance is not available, the repairman may weld with the machine, using a rod that will load the machine to at least two-thirds capacity. He should note if there is any appreciable arc at the brushes on the welder commutator. If so, the armature is either shorted or, more than likely, it has an open circuit between one or more armature conductors and the commutator riser. An open circuit between an armature conductor can usually be detected visually by rotating the armature by hand and looking at the end of the conductors in the commutator riser. A loose connection will invariably leave a dark outline around the conductor.

There are some cases in which an exciter armature will short out after getting hot as a result of expansion of wire at a spot where the insulation has been broken down, or as a result of centrifugal force. This trouble is difficult to locate because when the armature is removed from the machine and tested it will invariably test clear.

*Mr. Gill is associated with the Foshee Electric Company, of Fort Worth, Texas.



An engine driven "Shield-Arc" Welder with Dual Continuous control. These welders are available in 200, 300 and 400 ampere sizes. (All photos with this article used through courtesy of Lincoln Electric Company.)



Left, control box showing starting switch and no-voltage motor protection of Shield-Arc S.A.E. machine. Right, operator points to switch located in control box for changing polarity of welding circuit.

The writer has found that the best method for testing an armature with this kind of trouble is to remove it from the machine and heat it either in an oven or by wrapping bare copper wire around the commutator while on a growler. After the armature is hot, remove the wire and test on the growler while pressing the winding down with hand or by tapping with rawhide mallet using the feeler to detect any temporary short. If all these methods fail to locate the trouble, there are certain other tests that can be made before dismantling the machine.

Ohmmeter Tests Helpful

The following tests should be made with a low reading ohmmeter, if available, or with a continuity test using a battery and voltmeter. If it is a series type of exciter circuit, that is, if the exciter armature, the exciter fields, the welder fields, and the exciter rheostat are in series, the following procedure should be followed:

First, lift one exciter brush, putting one test lead on one brush holder and the other lead on the opposite one, then note reading on voltmeter, or ohmmeter. No reading at all indicates open circuit in exciter fields, welder fields or rheostat. If this condition exists, short out rheostat terminals, making same test again. This leaves only the exciter and welder fields to test. To test the welder fields, connect one test lead to field side of rheostat and the other to the junction between exciter and welder fields. If all these tests fail to disclose any trouble, the machine should be dismantled and tested for shorts, opens and grounds.

In testing the welder armature for shorts, the usual growler method is employed, any short being easily detected by the feeler (saw blade), but seldom do we find a shorted welder armature. Most trouble is due to open or partly open connections in the commutator.

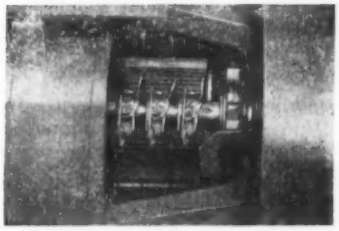
The usual method of using a hacksaw blade to create an arc between commutator bars while testing on growler does not work satisfactorily, because of the very low voltage between bars and high resistance steel hacksaw blade. The author has found that the use of a piece of 3/16" bronze rod ground to a point instead of the hacksaw blade will give a good arc by sliding the point in the groove between bars. This will generally show up an open circuit easily.

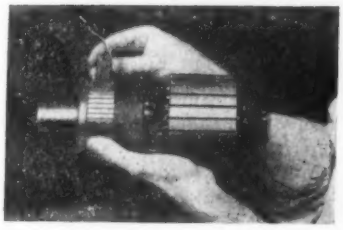
Testing Exciter Fields

The exciter fields may be tested for continuity by either an ohmmeter, or a lamp in series with a suitable voltage supply (preferably d-c). They may be tested for shorted turns by applying voltage across leads and reading the voltage drop across each coil. Any variation between readings, indicate shorted coils. A simple and sure method the author has used with success is to hold the coil, removed from pole shoe, over a growler so that the center of coil is over one pole of the growler, being careful not to let his hand or coil touch the growler. If the coil has shorted turns a vibration corresponding in frequency to that of the current supply can easily be felt.

In testing the main welder fields, unless you know the resistance value of a good set of coils and test them with an ohmmeter, the next best procedure is the test for voltage drop across each coil as outlined above.

(Continued on page 69)





Above, commutator and brush holders of Shield-Arc S.A.E. machine. New brushes should be worn in carefully to fit the curvature of the commutator. Below, exciter for S.A.E. machine, showing the position the brush should have on the commutator.

Formula for Training Appliance Servicemen

By Walter R. Moulton*

ELECTRICAL appliance repair shops have experienced a serious loss of manpower to the armed services and to war industries, while demands for repair service have grown far beyond normal, and the rate of increase continues as appliances grow older.

To meet these abnormal demands in the face of decreasing manpower reserves, the Service Trades Division of WPB's Office of Civilian Requirements has suggested that repair shops form groups in their own communities to promote training programs for appliance repairmen.

Many electrical appliances which, under normal conditions, would have been replaced by new appliances, are still in use. These must continue to serve the requirements of civilians until such time as production can be resumed. Consequently, the need for repair services can be expected to increase steadily.

Additional qualified repairmen are no longer available in any community. It is therefore urgent that steps be taken to provide for more electrical appliance repairmen in order to meet this emergency condition.

In any community the local electrical appliance repair shops should get together and form a committee or a group to promote a training program for appliance repairmen. In carrying forward their plans, the committee should take the following steps:

1. Check Existing Training Programs. Determine what local training programs, if any, have been set up or are being set up. If there are any training plans existing, information can be obtained from the sponsors as to the best way to proceed.

2. New Training Program. The Office of Civilian Requirements field representatives in the regional and district offices of the War Production Board are prepared to help in promoting such a training program. Call on them for assistance.

3. Setting Up Training Program. It is the function of the War Manpower Commission, Bureau of Training, to organize the planning and setting up of a training program and making other arrangements. The nearest WMC office should be requested to assign a representative to help the local group organize.

4. Contact the Head of the Local Vocational School. The head of the local vocational school will arrange for space, and collaborate in securing textbooks and instructors, and will arrange to commence instruction upon completion of plans. The local vocational school is prepared to supervise the instructors and work with them throughout the course. If there is no local vocational school, the superintendent of schools in the community can make the necessary arrangements, the details of which he can secure from the State Director of Vocational Education. Federal funds for vocational training have been made available through the U. S. Office of Education.

5. Contact the County Agent. The Extension Service County Agent should always be informed of any training program being planned, and he should be given an opportunity to participate in the planning and conduct of the program. His intimate knowledge of people and conditions in his community will be a valuable contribution to the program. He will also be familiar with the various extension service bulletins published in the state. Many of these bulletins would make excellent textbooks for use in the course and for repairmen's reference after completion of the training course.

The U.S.D.A. Extension Service have long been leaders in developing organized cooperative activity in rural communities for the dissemination of information and knowledge through practical demonstrations and training programs.

About 40 per cent of American farmers now have electrical service, and are vitally interested in the repair and maintenance of electrical appliances and apparatus. In many states the extension service has sponsored electrical repair training schools in which farmers learn the fundamentals of maintenance and minor repairs of electrical appliances and apparatus. Major repairs, however, must usually be handled by electrical appliance repair shops.

6. Determine Program Details. In coordination with the several foregoing interested parties, a proposed program of the training course should be set up. Subject matter should be determined along with such details as the number of classes, the time of classes, etc.

7. Select Textbooks. Several possible textbooks are available for use in training. A number of the leading manufacturers of electrical appliances have developed training courses, most of which are quite broad and well planned. In addition to textboks, they often include films, charts, etc.

Certain courses would have limitations covering only such electrical appliances as the individual manufacturer produces. Other manufacturers produce a complete line of appliances and have a repair training course covering all of them. While any manufacturer's course specializes on his own products, the basic principles are generally similar, and manpower trained for any course could readily adapt itself to handling repairs of other manufacturers' products.

The committee should write or call on distributor representatives of two or more manufacturers requesting that they bring or send samples of their training materials. Selection should be made of such materials as seem appropriate to best meet local needs. The manufacturers' representatives may even go so far as to assist in the training course by presentation of sound films or charts for one or more of the classes.

8. Number of Trainees. The group should determine how much additional help is required in the repair shops of the community and steps should be taken to recruit at

*Mr. Moulton is connected with the Service Trades Division, Office of Civilian Requirements, War Production Board, Washington, D. C.

least that number of people to take the training courses.

9. Recruiting Trainees. Contact the head of the local office of the United States Employment Service. The U.S.E.S. will advertise for the men needed, and will submit them to the repair shops requiring help. The U.S.E.S. will also clear any trainees that the repair shops may have ready to enroll in the course. This is a requirement in all defense areas.

Sources of additional manpower will be found in men of over-draft age, men deferred by physical disabilities, women, and professional people who are interested in contributing to the war effort and who can work part time. Special emphasis should be placed on the opportunities for returning veterans to learn a new vocation having assurance of stability. Many veterans have acquired new skills in the armed services which can be adapted to this industry.

10. Employment of Trainees. It is recommended that the repair shops actually place trainees on their payrolls and provide "on the job" instruction during the period of training, in order that they may obtain practical experience during the period of training, and thus make more rapid progress. These trainees should have the further assurance of employment as a repairman at a specified wage upon satisfactory completion of the training course.

The above training plan, if energetically promoted and followed through, will produce a valuable addition to the manpower in electrical appliance repair shops in any community. The outline of the steps to be followed is based upon actual experience of programs which have been promoted and successfully carried through in a number of cities.

Suggested Outline for Training Course For Electrical Appliance Repairmen

Part Subject:

1. Scope of the Business. Electrical Appliances and their use; Fundamentals of electricity; Application for heat; Application for Power; Tools and their use; Safety.

2. Lighting Equipment. Permanently installed lighting; Portable lighting; Circuits and Controls; Maintenance Repairs.

3. Small Electrical Heating Appliances. Various types and use; Care, maintenance and repairs.

4. Fractional Horsepower Motors. Principle of operation; Types of motors; Simple care, maintenance and repairs.

5. Vacuum Cleaners. Principles of operation; Types of cleaners; Maintenance and repair.

6. Washing Machines. Types and principles of operation; Fundamental operations care; Mechanical maintenance and repair; Electrical maintenance and repair.

7. Ironers, Fans and Mixers. Types of each appliance; Principles of operation and use; Operating care and maintenance; Repairs.

8. Electric Ranges. Principles of operation; Major parts and use; Operating care and maintenance; Repairs.

9. Refrigerators. Principles of operation; Major parts and use; Operating care and maintenance; Simple repairs; (Major adjustments and repairs by refrigerator expert only).

10. Radios. Principles of operation; Major parts; Operating care; Simple repairs; (Major adjustments, tests and repairs by radio specialist only).

Classroom. Any suitable room of sufficient size for the number of trainees, with proper chairs (preferably with side arms, tables or desks), good light, heat and ventilation will serve as a classroom.

Make sure to have a large blackboard, chalk and eraser available.

Textbooks. Textbooks should be selected and obtained before starting the course.

Demonstration Equipment. Actual tools, appliances, motors, cords, etc., to be discussed should be in the classroom for the subject covered.

Review and Test. At the end of each session there should be a review of the important features and test questions should be answered by trainees to determine progress of the trainees.

Records. A record should be kept of the attendance by individual trainees; also of progress made by them individually.

The Electric Motor in Mechanized Warfare

The vital role of the electric motor in the Allied surge toward victory is underscored by increasingly heavy production demands being made on the manufacturers by the armed forces.

Cutbacks on some military programs have occurred, but the need for electric motors is greater now than in 1943, despite a quadrupling of production since 1941, the War Production Board points out.

Highlights of the electric motor's wartime assignments, presented by WPB and the manufacturers, include:

Eighty per cent of all electric motors are sent directly to the armed services, with two-thirds of these going to aircraft and ships. The remaining 20 per cent go to other war and essential civilian programs, including radar, communication, lend-lease, high octane gas and synthetic rubber.

Virtually every instrument of war depends on the electric motor. Some bombers require more than 250; landing craft, up to 140; battleships, as many as 900. Production goals for 1944 include 100,000 planes and 80,000 landing craft.

More than 40,000 different motor models are required, built to special standards to meet strenuous wartime service.

High Speed X-Ray Tubes Holds New Possibilities

A major contribution to industry, medicine and even the dinner table is expected after the war from a high-speed electronic tube that converts 2,000 amperes of electricity, at a pressure of 300,000 volts, into a stream of X-radiations.

Now used chiefly in ballistics research, the tube, according to electrical manufacturers, makes possible the study of the inner workings of machinery in motion and improvements in efficiency and durability of all mechanical and electrical devices.

With it physicians and surgeons, too, will be able to study bones and organs of the body in motion.

Technicians also report that a new type of plant can be produced by exposing seeds to these rays. They foresee production of new foods and a greater output from farm lands.

A new high-speed electric motor (60,000 rpm) is being produced to increase the output of airplane engines.

Scientists, using the electron microscope, are penetrating the secrets of natural rubber and developing methods of improving the synthetic product.

Training and Specialization Turns Out Skilled Repairmen

By Harrie H. Bierman

A WELL-PLANNED pattern for routine, peacetime operation easily can help an electrical generator and motor repair-shop to hurdle wartime obstacles and to clear away barriers to postwar normalcy. A specific example of such an "all purpose" design is that employed by the Electrical Equipment Company, Miami, Fla.

One of the most serious problems in motor and generator servicing today is the shortage of competent shop personnel. In this respect, Electrical Equipment probably suffers less than do many others in the same line of business.

According to Floyd Kemp, the firm's service manager, the lack in South Florida of skilled motor and generator repair men is not entirely a by-product of wartime conditions. Even before the war, the available supply of dependable shop men was not too plentiful. Therefore, to remedy the situation, insofar as its own operation was concerned, the company installed a shop training program, which has been most successful.

Mrs. E. M. Flood operates a coil winding machine and supervises other women workers in the shop.

Given an adult of average intelligence and a sustained desire to learn, Electrical Equipment in most cases can turn out a worker having usable skill. This statement applies to women as well as to men and also to trainees who are not 100% physically fit. One shop employe, who is the victim of infantile paralysis, does not have full use of his legs. However, there is nothing wrong with his head or his hands, and Kemp credits him with doing excellent work on jobs which do not require too much movement around the shop.

An outline of Electrical Equipment's motor and generator servicing coverage may help in pointing up the firm's personnel training-plan. The company repairs and reconditions a-c and d-c units ranging from 1/40th to 50 hp. These units serve a wide variety of uses. They power medical and dental apparatus, home appliances, commercial refrigerators, vending machines, air conditioning systems, electrical record-players, farm and marine lighting equipment and industrial machinery.

An operator uses precision testing equipment for checking an automotive generator.

The firm does a volume business, also, in servicing automotive electrical units — generators, starting motors and voltage regulators.

Returning to the company's training program, one important feature of the plan is a "break down" of operational routine into its fundamental parts. For instance, the job of winding a motor is separated into individual operations for dis-assembling, burning, stripping, coil-forming, taping, winding, testing, cleaning and re-assembling.

Women Employees in Shop

This system works out especially well in the training of women operatives. When employing the latter, the best results, Kemp reports, are obtained by keeping each woman worker to her own specific task. The average woman who seeks employment in a motor repair shop, says Kemp, is interested only in the compensation involved. She has no ambition to learn the business.

She will master what is necessary to do an assigned job, such as coil-forming, taping or winding, but is not too willing to learn all three operations, or even two of them. Kept to a single operation, she is neat and careful, and has the patience to do her work well. Given satisfactory pay, hours, and working conditions, she will stick.

Electrical Equipment now has in its shop three women workers. One of them, who formerly was a cafeteria cook, has been with the firm for three years. She operates a coil-forming machine and supervises the work of the other two women. The latter are winders. One of them previously was a waitress and the other a housewife.

Matching up by aid of a color-chart and colored sleeving on formed coils, women operatives have no trouble in hooking up

the coils correctly. Before dipping, finished work is tested by the shop's motor-repair supervisor.

The "break down" principle easily may be applied to motor and generator reconditioning operations other than winding.

To facilitate the systematic handling of units brought in for repair, they are tagged as received with necessary information. Much of this, of course, may be obtained from the data plate on the unit, itself. The smaller units are stored on an "incoming" shelf. Naturally, heavy units must remain on the floor. However, all are processed in the order in which they come in. When work is completed, the lighter units go onto an "outgoing" shelf to be called for. The company conducts no pickup or delivery service.

During normal times, the firm regularly stocked approximately 150 new and rebuilt motors for various uses in capacities from 1/6 to 2 hp. Later, the inabiilty to obtain new replacements and repair materials in sufficient quantity made it necessary for the company to discontinue temporarily its exchange service. Recently, however, the material-supply situation has eased up somewhat, and it has been possible for the firm to build up a modest reserve stock of reconditioned units (armatures and stators only) up to 1½ hp.

Automotive Work Handled

Rebuilt automotive generators, also are offered on an exchange basis. In dealing with automobile owners, especially "transients," the immediate replacement of nonfunctioning generators is important as a business-getter. Such customers can't—or won't—wait, so the business is won or lost, depending on whether or not exchange units are immediately available.

Since automotive generators often require more in the way of shop labor than of materials, the firm has been able to keep its replacement generator stock at approximately normal level. No exchange is offered on starting motors.

In addition to its motor and generator reconditioning operation, the company does a sizable volume in the construction of current-distribution panels. For this purpose it carries a large inventory of sheet insulating material in thicknesses ranging from 1/16th-inch to 1-inch. As part of its equipment, the firm has an electrically-powered saw for cutting the material to required size.

Electrical Equipment was established in 1912 by W. W. Luce and Fred Borton. Becoming interested in radio broadcasting, Borton eventually withdrew from the firm in order to devote his time to the operation of a radio broadcast station. Luce still heads, as its president, the company he helped to found. However, the major burden of conducting the business rests with his son, Marshall Luce, who

Floyd Kemp, service manager, reassembles a repaired diesel engine starting motor.

serves as vice-president and general manager.

When the company began business, Miami was only a small town, having but a few thousand inhabitants. In its earlier days, the firm's operation consisted chiefly of servicing and rebuilding storage batteries, plus some power-unit repair work.

As the city grew and the employment of electrical powering increased, the company expanded its servicing coverage to meet the broadened demand. Besides the services already mentioned, Electrical Equipment handles, as separate departments, certain "associated" operations. Among them are battery recharging and the correction of all types of automotive electrical "troubles." Included, too, is the repair of gasoline

A workman overhauls a portable 6-volt lighting unit. Volume of this work makes separate department necessary.

engines used to motivate self-powered lighting plants, such as those employed on farms or boats. Three men are kept busy in the last-named department.

In addition to Kemp and the three women operatives mentioned, the motor and generator repair section of the business is staffed by 14 male employees. Of these, one is a receiving clerk, one is a stock-keeper, two are winders and the rest are engaged in motor and generator reconditioning and testing.

The company acts as service representative for Wagner Electric Corporation and as sales representatives for Robbins and Myers, Delco and Sunlight products. To serve its customers, the firm stocks winding wire of many types. It carries, also, bushings, bearings and other parts for the repair of motors, generators and magnetos. Much under normal, of course, the dollar value of the company's inventory of repair materials stocked for its own use now exceeds $5,000. Since Electrical Equipment serves as distributor for various power-unit repair parts, the shop can call on the company's re-sale stock, too, for any needed items.

An important factor in Electrical Equipment's effort to give its customers efficient service on power-unit repairs and to stretch its manpower to cover present re-

(Continued on page 66)

Safety, Sanitation, Efficiency Achieved in Electric Kitchen

By O. D. Hall

IN A RESTFUL atmosphere of Oklahoma murals, shining walls and new furnishings and equipment, electricity is pulling the load in the Temple Cafeteria, Enid, Oklahoma, formally opened in April of this year.

Some may wonder how new equipment, furnishings and materials for this modernization could be obtained so quickly in wartime. The remodeling job was planned and put through as a necessity within four months, with the approval of the War Production Board. The new owner of the cafeteria, Charles E. Knox, Enid oil man and rancher, was able to show that much of the old equipment had become worn out, hazardous in operation, unsanitary and inefficient. He also showed that Enid is an important war and essential industry center and that many men and women, who are engaged in these activities, are among the patrons of the cafeteria.

A keynote to the situation was sounded by Franklin Kane, kitchen engineer of Oklahoma City, Okla., when he said after the remodeling work had been finished: "Never before have I designed or seen another kitchen that so completely meets army, navy and civilian sanitary requirements as this truly outstanding kitchen."

The Oklahoma Gas and Electric Company, which supplies and distributes electricity in more than 200 cities and towns in Oklahoma, worked right along with the cafeteria ownership and the kitchen engineer in planning the modernization through B. C. Spencer, in charge of commercial cookery in the company's sales department.

Substantial aid of this kind is being given by the utility company all over the state in connection with commercial electrification projects. The company does not sell equipment or supplies but it cooperates with electrical contractors, supply houses and engineers in planning and installing electric kitchens and other electrification enterprises, and advises management on proper connected loads. Although it does no servicing work itself that possibly can be done by commercial service men, it offers free advice and inspection upon request.

The "Reddy Kilowatt" kitchen is the particular pride of the Temple cafeteria owner. He conducted hundreds of people through it at the formal opening and explained operations and purposes of the modern electric equipment.

As a fundamental requirement in sanitation, floors and walls in the kitchen are covered with grease and dirt resisting materials, easily kept clean and shining. The floor covering is of greaseproof tile and the wall covering is pyroxlin-type white enamel.

Work of cooking and preparing foods in the kitchen is reduced to a minimum of effort by smoothly operating new electrical appliances, machines and equipment. A Hobart Model X-M2 electric dishwasher, powered by a one horsepower electric motor, helps materially to carry out the sanitary theme in the kitchen. It pumps water at a rate of 140 gallons per minute. Dishes are washed at 135 degrees and sterilized at 190 degrees. The heat of this operation kills all bacteria and dries all dishes without the touch of human hands. Hot water for the dishwasher is furnished by a hot water booster heater. Soiled and clean dish tables are constructed of 14 gauge galvanized steel. Clean dishes pass automatically from the dishwasher on to a clean dishtable where they are transferred to a plate storage cabinet constructed of steel finished in white Duco.

Other labor saving appliances include a three-speed electric mixer and beater, powered by a ½-hp motor and an electric vegetable peeler. The latter pares all root vegetables, including potatoes, and makes them ready for cooking without human handling. Water and vegetable peelings

General view of Temple Cafeteria's all-electric kitchen in Enid, Oklahoma. Equipment includes reach-in refrigerators, electric baking and roasting ovens, electric mixers, peelers, and dishwashers.

from this machine are discharged into a peel trap set into a vegetable preparation sink. Sinks used in connection with this machine, as well as chef's sink, are constructed of 14-gauge hot-dipped galvanized steel, finished in white Duco enamel. Baker's and chef's work tables are constructed of hot-dipped galvanized steel with vermin-proof bins and drawers, finished in white Duco enamel. The table tops are of 3-inch thick laminated maple. Construction and finish of this equipment assures strength, cleanliness and sanitation.

A modern, double-decked steam pressure cooker preserves all vital mineral salts and life-giving vitamins in the vegetables as they are cooked.

Two large 60 cu. ft., reach-in electric refrigerators insure proper preservation of meats and other perishable foods. Pride of the culinary department is a big 12-kw, Model 227 Edison Hotpoint electric, two-compartment baking and roasting oven. Temperature controls in these units bring out the finer texture of pies, cakes, rolls and meats.

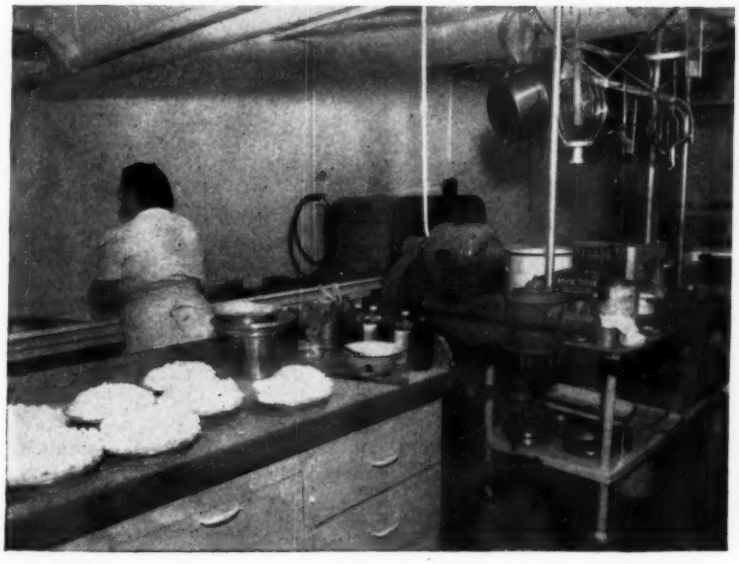
Other electrified kitchen equipment includes Edison Hotpoint deep fat fryers, Hobart slicing machine, Toastmaster toaster and hot and cold food serving units.

While some of the most modern air-conditioning equipment was not available, the management has obtained satisfactory results through a proper arrangement and installation of fan units. Air in the main dining room is changed every two minutes by use of a 48-inch, ½-hp electric fan. Odors in the kitchen are kept down and air is completely changed every minute through a 24-inch electric exhaust fan, powered by a ½-hp motor.

The electric cooking equipment in the cafeteria has a connected load of 19 kilowatts. In addition, motors and smaller electric motor units aggregate 2-1/3 hp.

Electric wiring sufficient to take care of present needs was already in the building. At the time of the opening, the cafeteria was utilizing the old incandescent electric lighting units. However, the management is planning a more modern lighting system although some wartime substitutes in the plans may be required.

A number of large murals depicting early day rural scenes in Oklahoma and development of the oil industry add to the beauty of the main dining room, where patrons also find themselves in a setting of palms and shining new furnishings. This room seats 450 persons with plenty of room to spare. On occasions, such as banquets, this seating capacity can be doubled without over-crowding. Then there is a smaller connecting dining room used principally for private parties, clubs and other organizations.



Other views of the electric kitchen and the spacious dining room.

An attractive asphaltum tile covers the dining room floor, while attractive tables and leatherette-covered chairs accommodate the diners. Moving through a segregated lane, patrons are served foods from behind glass on a long serving counter.

The modernization improvement was made at a cost of $15,000, of which $7,500 represents investment in the new kitchen installation. Mr. Knox, the owner, estimates that his business has increased 100 per cent since he took over the cafeteria and electrified it.

The Temple Cafeteria is located in the Masonic Temple building, 303 West Broadway, Enid. The Enid headquarters of the Oklahoma Gas and Electric Co. also are located in this building.

Bridging the Gap . . .

Household furnishings not only hold up the sales volume but have also proved effective as store traffic builders.

By Geo. H. Watson

UNTIL MAJOR appliances are available again in quantity, house furnishings are bridging the gap for Anniston Electric Co., Anniston, Ala.

As expressed by Frank Kirby, "electrical appliances put us in the house furnishings business and the house furnishings business will put us back in the appliance business." He explained this by stating that when appliances were frozen this concern began stocking other merchandise which it could sell at a profit in order to take advantage of the considerable floor traffic that resulted from customers coming in to pay bills on previous purchases. This floor traffic has not only been retained but increased and will furnish the nucleus for the sale of refrigerators, ranges, washers, radios and other appliances when they become available again.

The store now offers quite a carnival of values for the home, including china, glass, bathroom accessories, floor coverings, cleaning supplies, garden tools, home laundry equipment, paint, and hundreds of miscellaneous items from ration book holders to invalid chairs. The concern even has a "5 & 10 cents counter" of notions and novelties including tooth paste, face powder, hair nets, soaps and lipsticks.

And while taking on these additional lines the company still has a surprising amount of electrical goods for sale. These include refrigerators (for those with priorities), lamps, heating pads, a few radios, toasters, fans and lighting fixtures.

"In adding new lines, we shopped various markets for hard-to-get merchandise as well as items new on the market," said Mr. Kirby. "Occasionally a customer tells us she shopped all over town before finding the item in our store. In order to acquaint the public with our varied stock, we advertised in the newspapers, also mailed out hundreds of post cards listing many of the items in stock. All we had to do in many cases was to let the public know we had the merchandise and sales resulted. The post card, for instance, enumerated such unrelated items as lard cans, shopping carts, food choppers, brooms, clothes hampers, lunch baskets, mail boxes, clothes racks and clothes pins."

The company sold a good many electric refrigerators by listing just who, mostly military personnel or war workers, could buy them on priority. It also did a land office business on coal heaters prior to rationing, selling many on the layaway plan. It is still selling them by certificate. Ice box business this summer has been very good, the higher priced models selling best. Arrangements were made whereby an ice refrigerator was displayed in several outlying places such as barber shops, grocery stores and drug stores. This led to additional sales

"With this substitute merchandise we have had something besides the bare walls to offer the public," said Mr. Kirby. "We have made as high as 400 transactions in one day, which shows we are doing quite a volume and keeping our organization together. As specialty shops, we have always complained about the lack of floor traffic but we have it now and I am not sure but that we will continue to sell the household items as an aid to our appliance business."

While being essentially sales minded, Mr. Kirby said his concern enjoyed a large appliance re-

Household Items Found at Anniston Electric Company

25 EAST TENTH STREET

Lard Cans	Ironing Board Pads and Covers
Floor Lamps	Electric Clocks
Heating Pads	Coffee Makers
Shopping Carts	Clothes Hampers
Toasters	Clothes Wringers
Brooms	Rolling Chairs
Bed Lamps	Bicycle Baskets
Food Choppers	Lamp Shades
Pad Locks	Lunch Baskets
Mixing Bowls	Water Pitchers
Tin Pie Pans	Dishes
Refrigerators	Mail Boxes
Step Ladders	Clothes Racks
Bicycles	Iron Skillets
Heaters	Fire Shovels
Door Mats	Clothes Pins
Rub Boards	
Refrigerator Crisp Pans	

Shop often for household values at

ANNISTON *Electric* COMPANY

25 E. 10th Street • Telephone 115

This view of the Anniston Electric Company sales floor, Anniston, Alabama, shows considerable merchandise for sale in spite of the freeze on electrical appliances. Above, back of postcard sent out to customers to direct attention to the variety of items offered.

Another view of the Anniston Electric Company housefurnishings display.

pair business, this being in charge of his partner, Guy Dill. The repair business has grown considerably during the war and the company has all it can handle. It was necessary to devise a special system for keeping track of customers' appliances until called for.

School boys are enabling the Anniston Electric Company to carry on its considerable electrical service business. The boys come to work about 1 o'clock in the afternoons, work all day on Saturdays and during the vacation season.

"With these boys we have been able to fill in the gap caused by the manpowre shortage," said Mr. Dill. "I work right with them in the shop, operating what you might call a sort of continuous service school. However, we pick boys with shop experience in their schools as far as possible. We find that they catch on quickly, especially boys who are radio amateurs, and with supervision they soon become capable repairmen.

"We feel our responsibility to keep appliances now in the hands of the public operating, and for that reason we are repairing any type apparatus that comes our way. That includes refrigerators and radios as well as small table appliances, electric fans, vacuum cleaners, fractional horsepower motors, ranges and washers. We also service and install fluorescent lighting and did do a considerable electric wiring business."

Mr. Dill said he was getting a good supply of parts — more so than might be expected; but if a needed part cannot be obtained, then one is made, if possible. The concern has its own welding equipment.

Know Your Customers Is Dealers Success Formula

By B. C. Reber

DURING THE past 30 months, or since that day in December, 1942, when the Japs invaded Pearl Harbor, appliance dealers have faced their greatest test in history. Many have closed their doors and sought incomes in other lines of work. Many have moved into smaller quarters, seeking to reduce their overhead to a point where they might continue to operate. And many, after some effort, have given up the struggle and sold their stores.

But in San Antonio, Texas, there is a man who has proven his initiative and executive ability by refusing to be discouraged by these conditions. Instead, he has surveyed his market, sought out those channels through which business might be expected, and has then gone after this business in a manner that has brought in good returns.

The man is A. F. Beyer of The Beyer Company, a veteran in the appliance field. What he has accomplished may be better appreciated from a few concrete facts:

First: He has increased his business, enabling him to increase his floor space by approximately 50 per cent.

Second: He has purchased the property in which his store is located.

Third: He has purchased other property which he plans to develop as soon as the present emergency is passed, and he plans to establish a neighborhood store at a point located near the elite residential section of the city.

What Mr. Beyer has accomplished makes an interesting story—a story that every appliance dealer may read with profit. Discussing his work, Mr. Beyer says:

"When word came that the production of radios and appliances had been cut off for the duration, I immediately made an inventory of my stock so that I would know exactly where I stood. I had been fortunate in making some purchases so that we had a fairly good stock of radios and mechanical refrigerators on hand.

"It seemed only evident that, with production cut off, there would soon be a shortage of these appliances, so the logical thing to do was not to sell them, but to rent them on a weekly or monthly basis.

"It also seemed logical that there would be a big increase in the repair and maintenance of these appliances which had already been sold. Here was another opportunity which would be capitalized upon by going after this business.

"How?

"After studying the matter over for a few weeks, carefully weighing each opportunity for telling the public of our service, I decided upon two mediums: radio and classified advertising.

"I considered direct-by-mail, but discarded it because it entailed a lot of work. There would be the difficulty in getting help — good,

(Continued on page 66)

Capacitors Release Capacity For Essential Wartime Loads

By A. Watts Wagner

DURING THE early part of 1943, the Virginia Electric and Power Company placed in service at its Rosemary Switching Station, in Roanoke Rapids, North Carolina, a 3,645 kva bank of static capacitors with automatic voltage controlled three-step switching equipment.

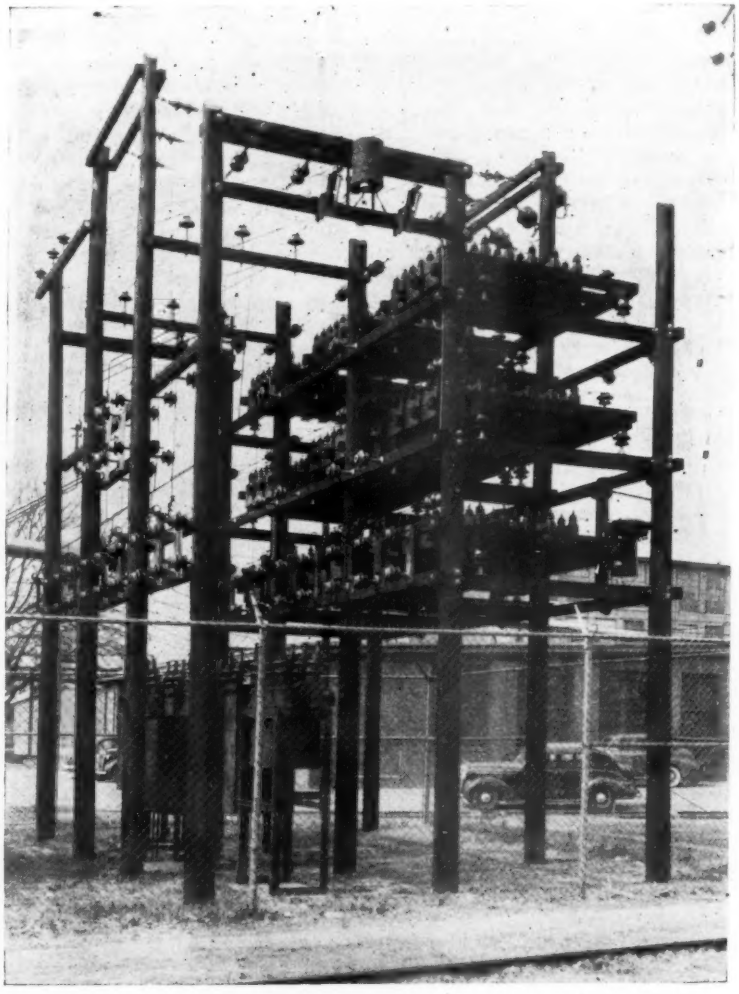
This installation was part of a system program of installing static capacitors, which the company initiated during the spring of 1942, to release generator and transmission line capacity, urgently needed to meet the demands of the large war loads coming on its system. Installing static capacitors was not only the quickest means of obtaining this badly needed capacity but would accomplish it with the use of the smallest amount of critical materials, the conservation of which was a paramount issue at that time.

In order to derive the maximum benefits from the capacitors it was decided to locate the capacitors on distribution feeders and substations in accordance with the kvar requirements of the load, rather than banking them all together at one or two locations on the transmission system.

In line with this plan, the 3,645 kva bank was installed at Rosemary Switching Station, which is the center of distribution for a considerable part of the low power factor cotton mill load in the Roanoke Rapids area. This station is supplied by three 6,900 volt feeders, each approximately two miles in length, from the Roanoke Rapids Hydro and Transmission Station.

The total mill load supplied through these feeders is 7,000 kw at an average power factor of 78%, or 9,000 kva. Previous to the installation of the capacitors, the voltage at the mills often dropped to a nearly intolerable low level. This was due in part to the line drops in the supply feeders and in part to low bus voltage at the power station caused by heavy loading of the transmission system. The bus voltage regulation at the switching station exceeded 13%. After the capacitor bank was placed in service a reduction of 7% in bus regulation was effected and the load on each of the three feeders was reduced by approximately 50 amperes.

The Rosemary installation consists in the main of three banks of 81 15-kva, 4,150 volt single phase outdoor capacitor units, or a total of 243 units, mounted on a woodpole type structure and three 15 kva electrically operated outdoor oil circuit breakers with automatic voltage control equipment. The capacitor units making up each bank are mounted at three levels



A 3,645 kva bank of capacitors has been installed at the Rosemary Switching Station, operated by Virginia Electric and Power Co., at Roanoke Rapids, North Carolina.

*Mr. Wagner is system engineer for the Virginia Electric and Power Co., Richmond, Va.

(each level a phase) in adjacent bays.

Since 4,150 volt capacitor units were being used on a 6900 volt system, it was necessary to insulate the capacitors from ground and between phases. This was accomplished by mounting the timber racks supporting the units making up each phase of each bank on pedestal insulators. The breakers controlling these banks do not connect them directly to the station bus but to the line side of a large feeder breaker supplying an emergency service. The three banks are sequentially energized and deenergized in response to variations in bus voltage.

The scheme used for protection against failure of a unit is as follows: Each of the three banks is divided into two groups connected "wye" with neutral "floating". A 4150 volt potential transformer is connected across the two neutrals, which in case of failure of a unit in either group actuates an instantaneous voltage relay which trips and locks out the breaker controlling the particular bank in which the faulty unit is located. Overload relays on the main breaker connecting the installation to the station bus is relied upon for protection against external faults.

The preliminary engineering of this project involved several problems: first, what voltage capacitor units to use; second, how to protect against failure of a unit; and third, how many and what interrupting capacity breakers to install for switching the capacitors?

Three different voltage capacitor units were considered, 2400, 4150 and 7200. It was decided to use the 4150 volt units because they would be more generally applicable over our system and cost 15% less than the 7200 volt units and would lend themselves more readily to a simple protective scheme than the 2400 volt units which would have to be connected with three units in series between lines. The use of the 4150 volt units answered the second problem in that they could be connected in wye with neutral floating as described above.

Since calculations indicated that the proposed amount of capacitors would cause a voltage rise of from 7% to 8% when energized, it was decided to purchase three breakers and switch the capacitors in three steps so as to limit the change in voltage to about 2½% per step. By connecting the breakers to the line side of an existing high interrupting capacity breaker instead of to the station bus and depending on it for short circuit protection, we were able to use low interrupting capacity breakers with a large saving in cost and critical materials.

This capacitor installation has now been in service for almost a year and its operation has been entirely satisfactory. The variations in voltage are such that two of the banks, totaling 2430 ckva, are normally switched on and off twice daily while the third bank is switched on and off only once daily. The time delay relays are set for one minute which eliminates unnecessary switching due to voltage varia-

(*Continued on page 68*)

Connecting Induction Motor For Reduced HP Rating

By A. C. Roe

RECENTLY, a certain plant required a 15 horsepower, 220 volt, 3 phase, 60 cycle, 580 rpm induction motor for intermittent duty. The 580 rpm was an important factor as the motor was to be direct connected. A check on new and second-hand motors indicated that the only 580 rpm motor available within a reasonable delivery period was a 50 horsepower squirrel cage induction motor in good condition.

To use this 50 hp motor at 15 hp at best possible efficiency, it was necessary to determine if the stator windings could be reconnected for the lower rating and still have the winding in condition to be reconverted to the higher rating at a later date.

The 50 hp, 3 phase, 60 cycle, 580 rpm, 12 pole stator had 108 slots and coils, connected 6 parallel star, with 36 groups of 3 coils per pole phase group. The reduction from 50 hp to 15 hp is a reduction of $(50-15) \div 50 = 70\%$; thus the problem is to find a connection so that when connected to a 220 volt line, the motor will operate on under voltage of such a value that the torque and horsepower will be reduced.

For example, hp = (torque × rpm) / 5252. Since the torque varies as the square of the voltage or $T_1/V_1^2 = T_2/V_2^2$, the torque must be reduced in the ratio 15/50 or 30%. Since the 50 hp torque, T_1, equals $(50 \times 5252) / 580 = 452.76$, the torque T_2, for 15 hp, must satisfy the equation:

$$15/50 = T_2/452.76$$

and

$$T_2 = 135.82$$

As the torque varies with the square of the voltage, we can find the star or delta voltage required. The six parallel star connection is equal to $6 \times 220/1.73 = 762$ volts per phase, thus the series star line voltage would be 1320, and the series delta line voltage 762 volts.

To develop 15 hp and a torque of 135.82 we must find a connection that would require a line voltage equal to

$$V_2 = V \sqrt{T_2 \div T} \text{ or}$$

$$1320(\sqrt{135.82 \div 452.76}) =$$

$1320 \times .5477 = 723$ volts for the series star connection.

This means that where we operated on 220 volts for the six parallel star connection, we would have to operate on $723/6 = 120.5$ volts for 15 hp, but as the line voltage is still 220 we must find a connection that would require a higher line voltage to obtain the under voltage effect, or a connection requiring $220 \times (220/120.5)$ or $1.8 \times 220 = 396$ volts. Then dividing 1320 by 396 we get 3.33. A three parallel star connection would give the effect of $1320/3 = 440$ volts or 11% more than required. Then $762/396 = 1.92$ or a 2 parallel delta connection would require $762/2 = 381$ volts which is close enough for the 15 hp rating.

By changing the connection to a two parallel delta and operating on 220 volts the results are approximately the same as operating on 120-1/2 volts.

As the load only required a torque sufficient to develop 15 hp at 580 rpm, the current input is low and the motor operated satisfactorily and can be reconnected at any time for the 50 hp rating. This is an example of what can be done to meet various conditions by checking all possible angles.

High Temperature Insulation Reduces Equipment Weight

AS MUCH as 50 per cent reduction in weight of electric equipment is possible where design limitations are based on insulating temperature by using the new Silicone insulating varnishes. These high temperature insulations also make possible a substantial increase in the output of small motors using the same frame, where the operating temperature can be raised, Westinghouse engineers report. They offer the additional advantages of ability to operate at higher ambient temperature, and to greatly increase life when operated at present temperature conditions. Silicone resins, and their use as insulating varnishes and bonds, definitely fill the void between organic and inorganic insulating materials.

There has long been a demand for high temperature insulation having better thermal stability.

Designers have felt the need for such insulation for three reasons:

1. It offers possibilities for reduction in the size and weight of electrical equipment, with no reduction in service life, where the operating temperature can be increased because of this improved thermal endurance.

2. Greatly increased service life in the same size and weight where it is necessary or desirable to maintain present temperature limits.

3. Increased ambient temperatures which reduce limitations as to operating locations.

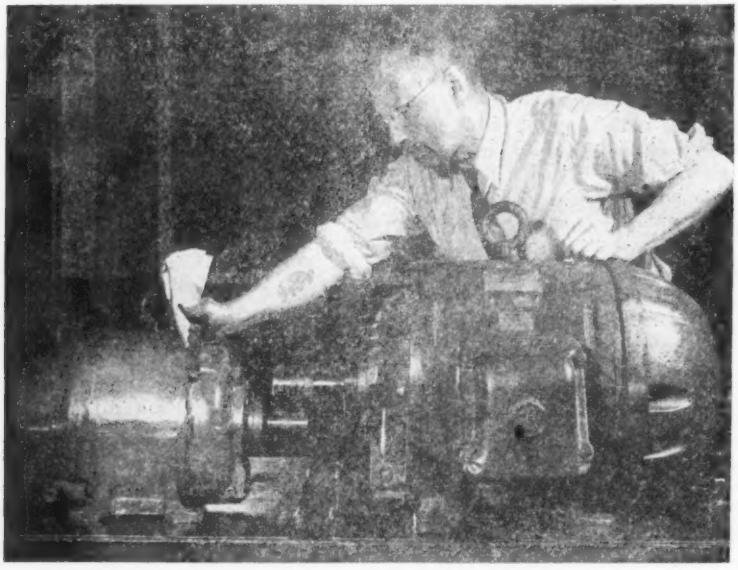
Recently developed Silicone resins and varnishes have tremendously better thermal endurance than any of the known resins and varnishes. New high temperature insulations have been developed utilizing these materials. As a result, it is possible to produce electrical equipment that has a much greater thermal endurance; as high as twenty to one on laboratory tests.

The Silicone materials bridge the gap between conventional organic insulating materials, which are limited with respect to heat stability, and ceramic type materials, which are not limited with respect to heat stability. Physically, they are quite similar to conventional resins, varnishes, and organic structures, but differ in that they do not readily decompose at temperatures of the order of 200° C. In actual use, the conventional insulating structures have been modified to incorporate Silicone resins throughout. This results in an integrated line of insulating materials which will withstand abnormally severe operating temperatures.

Over two years experience on actual equipment confirms extensive laboratory tests which showed these materials to be promising. For example: To meet a very special requirement, a 3 hp totally enclosed induction motor was redesigned for 10 hp with no increase in weight or size. Since then, more than 30 similar motors using high temperature insulation have been built and are now being tested under various conditions. A mine locomotive motor armature has been functioning perfectly under very adverse conditions for over a year since being rewound and high temperature insulated. Prior to this, insulation failures occured frequently, a few less than a month apart. Street car and trolley coach motors with Silicone insulation have been given exhaustive tests at elevated temperatures. Results show increased horsepower output at no increase in speed with no injury to insulation.

A 250 kva generator with high temperature insulation was operated in the laboratory for about 3000 hours at 250°C. with no ill effects to the insulation. According to the best available means for interpreting accelerated life tests, this should be equivalent to far more than normal life expectancy.

High temperature insulation on several hundred operating coils for magnetic contactors overcame a serious burn-out problem resulting from excessive temperature within the control box. Operating for more than a year without a single failure is the record of Silicone insulation as contrasted to coils failing within a year for conventional insulation. Air cooled transformer life has been increased and output improved when insulated with high temperature materials.



Though the motor on the left is but half as large as the one on the right, both produce 10 hp at 1750 rpm. Higher operating temperature makes this possible. The left hand motor is made with high temperature silicone insulation and operates at 175° C. total hot-spot temperature while the right hand motor is made with Class A insulation and operates at 105° C. The left hand motor weighs 210 lbs. and the right hand motor weighs 410 lbs.

Servicing Refrigerator Motor Starting Relays

Many appliance service men have unknowingly caused the destruction of G-E refrigeration motors by making improper adjustments and repairs to the starting relays.

THE STARTING relays used on General Electric refrigerating machines serve the purpose of connecting the starting winding of the motor into the circuit for an instant while the motor starts and comes up to speed. The motors used in these machines run single-phase but must be started with the help of an auxiliary winding, known as the starting winding. The starting winding has either greater resistance than the running winding or has a capacitor in series with it in order to give the necessary phase displacement to develop the required starting torque.

The starting relay consists of a coil of insulated wire on a pole piece and an armature to which is attached the movable contact arm. The coil is in series with the running winding of the motor. When the current is first turned on, with the rotor stationary, the initial heavy current through the coil is sufficient to move an armature and close a pair of contacts which places the starting winding in parallel with the running winding.

With the two windings in the circuit, the motor rotor starts o turn and almost instantly comes up to full-load speed of about 1740 rpm. The current drops rapidly from the initial inrush value of 13 to 19 amperes to the normal running value of 2 to 3 amperes. The adjustment of the spring tension of the armature is such that the magnetic force from the coil is overcome when the current has dropped to about half of its initial value and the armature opens the starting winding contacts. From then on, the motor runs single-phase with only the running winding in the circuit.

Starting relays and overload devices used on General Electric refrigerating machines are relatively simple in construction and represent only a small percentage of the total value of a machine. Yet, on them depend the proper operation and the life of the machine. They are designed, manufactured, adjusted and tested to perform their functions and to protect the machine for many years without attention or adjustment.

Since they require such careful adjustment to make them function properly, they must be handled with considerable care. The parts must never be adjusted or repaired. The following rules should be constantly kept in mind:

Do not drop a relay or throw it around, even though it is in its shipping carton. Starting relays and overload devices are as delicately adjusted as expensive electrical instruments and should be treated accordingly. Rough handling and dropping can alter the pick-up and drop-out characteristics of a relay.

Do not remove the cover from a relay unless absolutely necessary, and do not leave the cover off. There is a possibility of altering the pick-up and drop-out adjustments if the armature or frame is

---

This article is adapted from information obtained from the appliance product service section, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Conn.

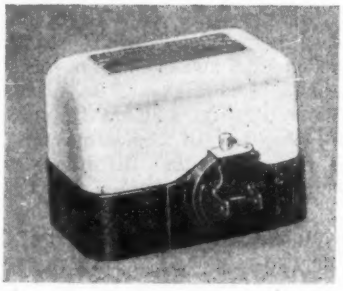


Fig. 1.

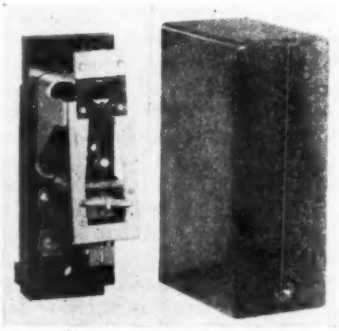


Fig. 2.

These are the G-E refrigerating motor starting relays with which this article is concerned: (1) Type E-3; (2) Type E; (3) Type N; and (4) Type R.

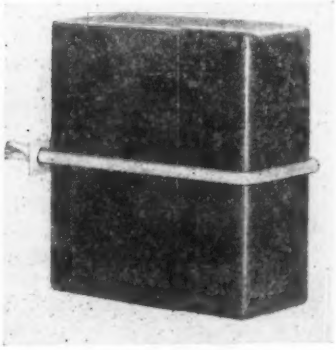


Fig. 3.

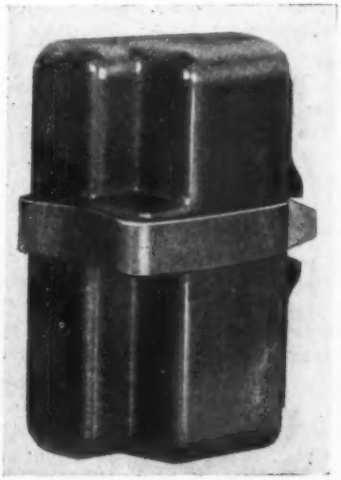


Fig. 4.

hit against or caught on the cover when the cover is removed or put on. If left around without a cover, the parts may be damaged and, in case of a type R relay, chips may get on the Alnico magnet.

The cover of type E-3 relays fits down onto the base, see Fig. 1, and is held with a nub on one side of the cover locking into a recess in the base, and a screw through a tab on the other side going into the terminal prong side of the base. As originally installed, a wire with a lead seal locked the screw to the cover.

Type E and N relays, as shown in Figs. 2 and 3 respectively, are held in their covers by a single long screw with a nut located in a recess in the relay base.

Type R relays, shown in Fig 4, are held in their covers by ribs molded in the base and cover. The base is prevented from going in too far by the inner rib of the cover bearing on the center rib of the base. The cover rib comes quite close to the end of the frame to which is attached the armature. Two small ribs on the inside surface of the cover hold the base in place.

To remove the cover, spring the sides of the cover with the fingers until the base drops past the ribs. Then pull the base out, keeping it square with the sides of the cover. It is helpful to place a screw in terminal 4 and use it to guide the base out and in. When putting the relay back in the cover, make sure that it is properly started so that the series coil goes down in the deep part of the cover. Then push it in so that the base is square with the cover sides all the way.

Keep the base square with the cover sides when removing and putting the cover on.

Do not tamper with the wax seals on the base of a type R relay. The small screws under them are sometimes mistaken for holding screws. Actually, they are overload adjusting screws and must not be disturbed.

If an R relay is left around on a work bench, either with the cover on or off, there is a possibility that steel chips may get on the Alnico magnet.

Do Not Adjust Relays

Do not adjust an armature. Relay armatures can be adjusted only with the aid of meters because their pick-up and drop-out current values fall within narrow limits. For instance, the M1A162 pick-up current must be 6.0 amperes plus or minus only 0.2 ampere.

Even slight bending of the armature—so slight that the gap is not changed perceptibly — can change the characteristics of the relay enough to make it inoperative on normal service. It is apparent that bending which alters the gap so that the change can be detected by the eye will render the relay entirely unfit for use.

The following table illustrates the effect of very slight bending of the armature of an M1A162 type R relay.

Pick-up current, amps.	Drop-out current, amps.
8.0 (high) (A)	6.9
6.0 (proper)	5.7
4.0 (low) (B)	3.9

Minimum pick-up voltage	Maximum drop-out voltage
100 (C)	over 200
80	170
50	110 (D)

(A) The armature is bent a **slight amount away** from the stationary contact. The amount that the armature is bent is so slight that the difference cannot be distinguished with the eye. Assuming an average gap of 1/8 inch with the relay held in its proper operating position, the gap after the armature is bent would probably not be increased as much as 1/64 inch. It is evident that, if the armature is bent so far that the gap is as much as 1/4 inch (as it is on some relays on machines returned to the factory), the minimum pick-up voltage may be 110 or even higher.

(B) The armature is bent a **slight amount toward** the stationary contact. The amount of bending (less than 1/64 inch) cannot be detected with the eye. If the armature or stationary contact arm is bent so that the contacts are still closer (less than 3/32 inch), the maximum drop-out voltage may be greater than the normal service voltage of 115 to 120.

(C) If the voltage at the machine is less than 100, the armature will not pick-up at all to close the starting contacts, and the overload will continue to trip.

(D) If the voltage at the machine is greater than 110, the armature will not drop-out to open the starting contacts, and the overload will continue to trip.

Do not file the contacts. No matter how carefully the filing is done, the pick-up and drop-out values will be changed. Frequently, the change is sufficient to cause improper relay opration, especially under unusual power conditions.

Never file the contacts of a type R relay because of the relatively light construction of the parts.

Although not recommended, the contacts of type E-3, E or N relays can be smoothed as described below.

If a replacement relay is not immediately available and it is necessary to smooth the contacts of a type E-3, E or N relay to keep the machine operating until the relay can be replaced, hold the contacts between the thumb and forefinger of the left hand so as to exert as little pressure as possible on the armature and contact arms. Gently press the contacts against the sides of a No. 1 or No. 2 cut steel file as it is moved back and forth a few times.

Do not use a coarse file (such as a nail file) or emery or sandpaper as particles may become imbedded in the silver.

Do not attempt to file the contacts far enough to remove all the pits.

After connecting the relay, check its operation with the cover off. Do not use it if the contacts remain closed more than an instant or the machine seems to start hard or there is more than slight sparking when the contacts open.

Care of Contacts

Do not replace a contact. Contact tips are made from fine silver (99.9 per cent pure). To replace a burned-out contact with a steel or brass nut and screw (sometimes loose in the contact arm) or a riveted contact means that the contact resistance will be high, the tips may rust and corrode, the natural period of vibration of the armature is changed by the difference in weight, and the pick-up and drop-out characteristics are changed while the contact is being put in (no matter how skillfully or carefully the work is done), and the motor in the machine is apt to burn out in time due to improper relay operation.

Most of the pictures reproduced here represent typical type E relays with either badly burned contacts or the movable contact missing. The condition which started the overheating, pitting and burning may have been low voltage following an electrical or sleet storm, a flood, or failure of some piece of generating or distribution equipment. Because of the low voltage, the machine started slowly, and the starting contacts stayed close longer than normal, overheated and began to pit. The higher contact re-

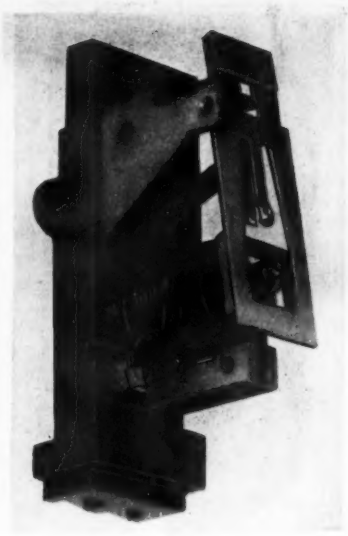


Fig. 5.

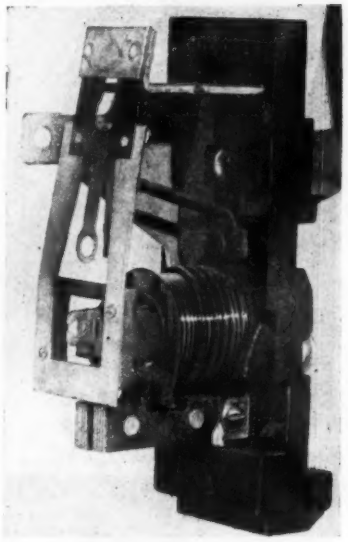


Fig. 6.

sistance resulting from the original pitting caused further pitting and burning. In time, the contacts were badly burned as illustrated in Fig. 5 or the movable contact was burned out as shown in Fig. 6. The complaint in both cases was "machine trips overload every few days."

The proper service adjustment in both cases is to replace the relay with a type R relay. *Never attempt to replace or repair a burned or missing contact.*

The following are some interesting examples of repaired relays, each of which resulted in a burned motor:

In Fig. 7, the missing contact was replaced with a brass screw and a steel nut. The head of the screw was pitted and burned. Even brass is not a satisfactory substitute for prolonged contact life for the conditions under which this relay has to serve. The nut and screw weigh more than the silver tip and consequently change the period of vibration of the armature. It is possible that under some operating conditions the armature might flutter and keep bringing the starting winding into the circuit.

In Fig. 8, a heavy flat steel contact is held in the starting arm by a heavy nut with upturned ends. It can be seen that the movable contact arm and the stationary contact arm support have been bent. A large flat-headed brass screw replaced the contact of the relay in Fig. 9. To get it in the hole, the arm was bent up and left there. The area of contact was very slight so excessive pitting and burning occurred on both contacts. In Fig. 10, the steel screw and nut replaced the contact in this relay. While making the repair, the movable contact arm was bent down. This condition would lower the drop-out limit and would cause the starting winding to be held in much longer than it should be.

In Fig. 11, a lump of solder was used in place of the missing silver tip. The contact arm was very rusty. In Fig. 12, the relay evidently continued to function after the contact dropped out until over half of the section around the hole had burned away. A sleeve section with another contact was attached to the contact arm.

Since the contact hole in the movable contact arm in the relay shown in Fig. 13 probably circled the stationary contact and might have even caught on it the end of the arm was bent back under. The contact resistance would be high between the two arms. The steel movable contact arm would burn away in time.

To the average serviceman Fig. 14 might appear to be the best repair job of all. A contact had been riveted in. There was no evidence of excessive burning or pitting. The material might have been silver. Close inspection would reveal only that the contacts were a little too close together and the stationary contact arm was bent down a little.

Actually, the pick up current was only 3.8 amperes (instead of 6.0 and the drop-out current was 3.4 (instead of being above 5.5). After the contact was riveted in,

Fig. 7.

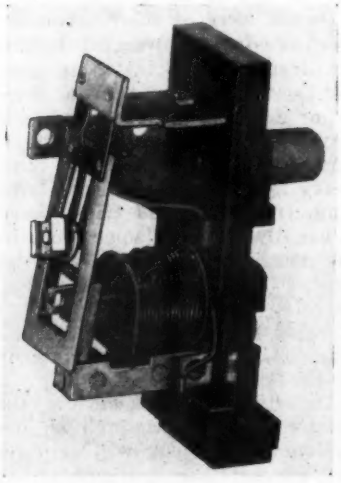


Fig. 8.

Fig. 9.

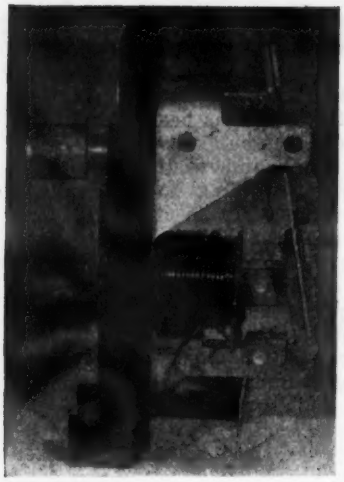


Fig. 10.

Fig. 11.

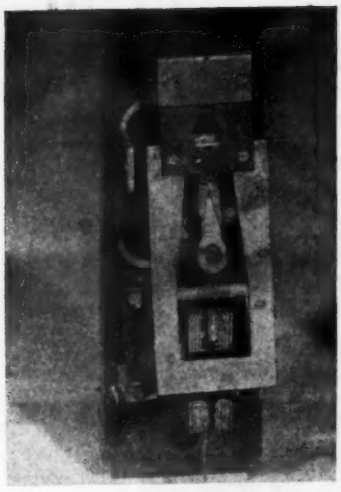


Fig. 12.

the armature had been bent down too far. The starting winding would be held in the circuit much too long each time the machine started.

Do not repair or replace an armature. Relay armatures are designed and thoroughly tested to avoid natural periods of vibration that might cause fluttering and breakage. The pick-up and drop-out settings are obtained by delicate adjustments to the armature after assembly. To repair a broken armature or contact arm by bolting, riveting or soldering the same piece or another is certain to change the natural period of vibration and the pick-up and drop-out characteristics (no matter how skillfully or carefully the work is done). The motor in the machine is apt to burn out in time, due to improper relay operation.

The pictures show examples of repaired relay armatures which were returned on machines with burned motors:

In Fig. 15, the movable contact arm had been broken or burned off. A larger section of spring steel had been soldered on. The blue-steel base of the armature was very rusty. The stationary contact arm had been bent down. Both contacts were badly pitted and burned. The stationary contact was almost burned away.

As in the previous picture, the movable contact arm was soldered to the armature but, in Fig. 16, there is no contact tip on it.

The movable contact arm broke off the type R relay in Fig. 17. It was then attached with a nut and bolt. This repair shortened and stiffened the arm so that the armature fluttered and caused the overload to keep tripping. The machine was returned for "—the motor would stay at first speed and not throw into high."

In Fig. 18, the armature had broken off at the springing point. A spring steel piece was riveted in its place. The front part of the armature was loose on the rivet that held it to the new piece. The contacts came very close together.

This armature in Fig. 19 was soldered to its support. The stationary contact arm was bent up so far that the contacts were closed all the time, and the overload kept tripping. An E-3 armature was bolted onto the support of the type E relay, shown in Fig. 20. A large contact was riveted to the movable contact arm.

The armature of the relay in Fig. 21 was riveted to the support in an upside down position. A sleeve with a contact replaced the missing movable contact and burned end of the contact arm.

Do not block or short-circuit an overload device. Overload devices are designed and tested to protect the motor under unusual power or load conditions, and yet leave sufficient margin to take care of normal pull-down and heavy load currents without tripping. If an overload trips, there is usually a reason somewhere in the machine, in the relay (the most frequent source of trouble, especially in machines with type E relays), in the wiring to the machine, in the house wiring, or in the service lines.

Defective overload devices are relatively rare (although an occasional solder-pot will trip on less current than it should).

To substitute a higher rated heater grid or to short-circuit the grid in a two-knob control (except when there is a type N or R relay on the machine), or to block

Fig. 13.

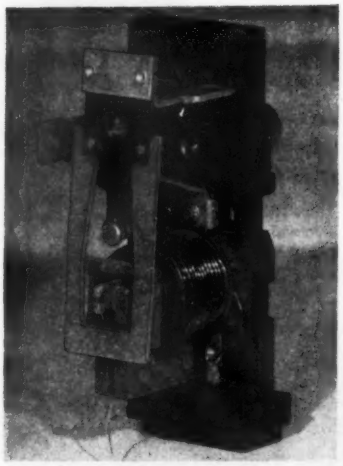
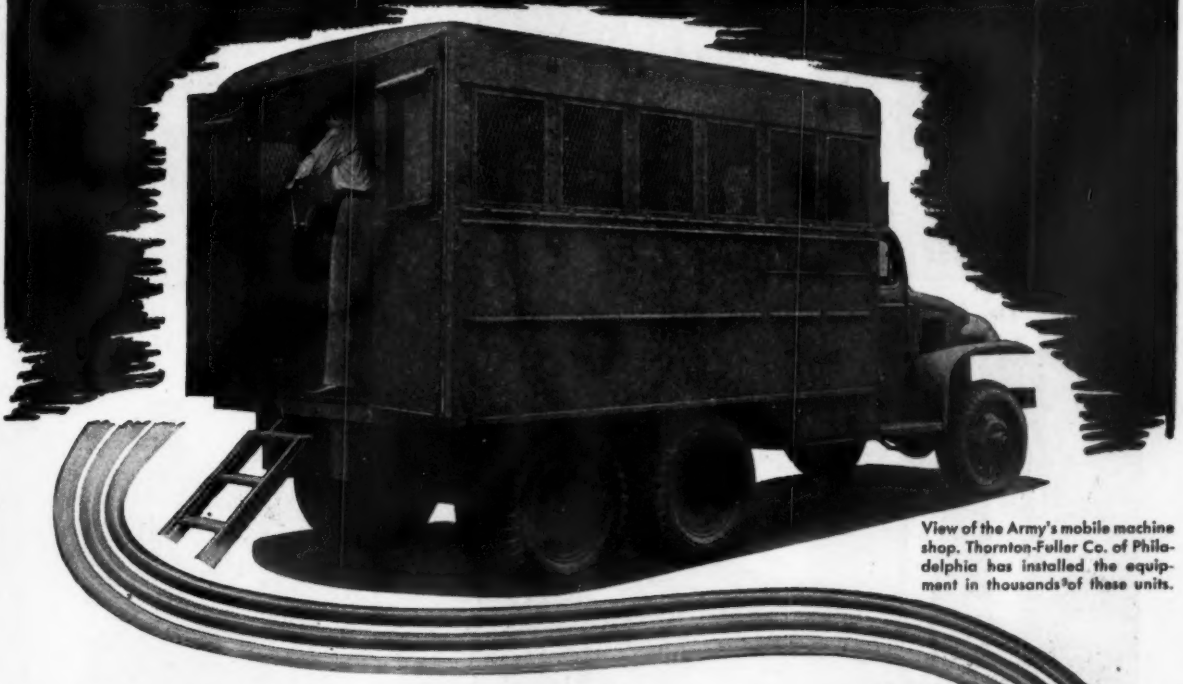


Fig. 14.

These "Front-line Repair Shops" are wired with WALKER "SYNTHETIC"



View of the Army's mobile machine shop. Thornton-Fuller Co. of Philadelphia has installed the equipment in thousands of these units.

Wherever the fighting machines of the allied forces go, you'll find these repair-shops-on-wheels somewhere near the battle. Within these amazing units are a lathe, drill press, shaper, work benches, saws and thousands of other items. A generator supplies plenty of light and power and the lighting system and machinery units are connected with WALKER "SYNTHETIC."

When you consider the tough conditions under which this wire must serve, its use in such installations is a tribute to the quality and dependability of WALKER "SYNTHETIC."

For wire of long-lasting durability—tough, flexible, high in dielectric strength, easy to strip and attractive in appearance—WALKER "SYNTHETIC" is the ideal answer.

Available in all standard colors—black, white, red, blue, yellow, green—and special shades on order. Sizes range from small diameter building wires up to 4/0.

Ask your Walker distributor for prices and delivery information. Or write to Walker Bros., Conshohocken, Pa.

Fig. 15.

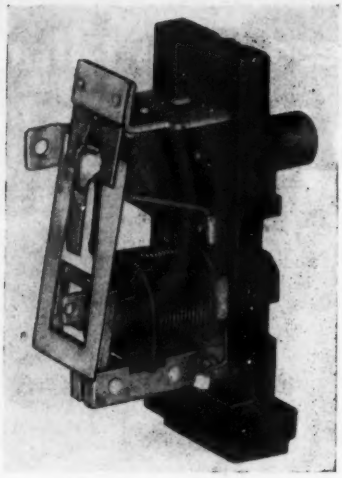


Fig. 16.

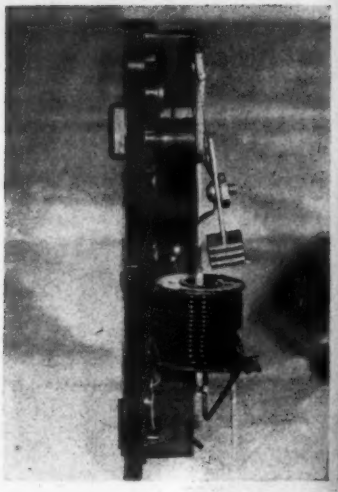


Fig. 17.

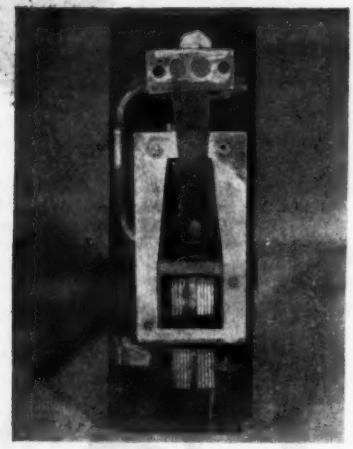


Fig. 18.

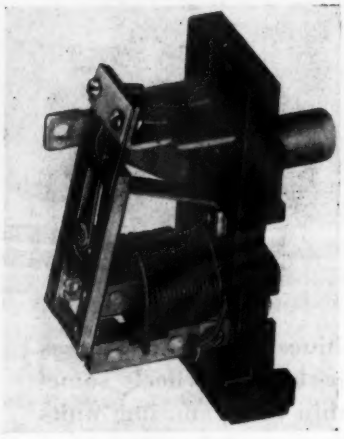


Fig. 20.

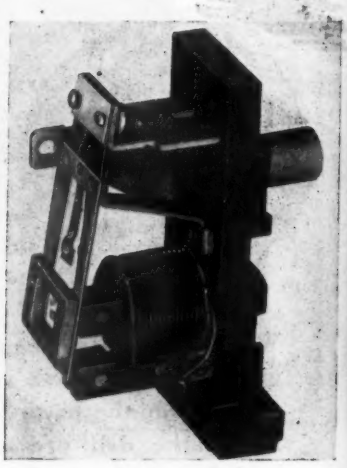


Fig. 21.

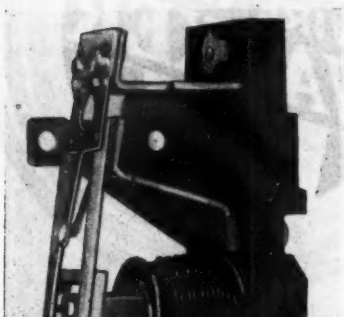


Fig. 19.

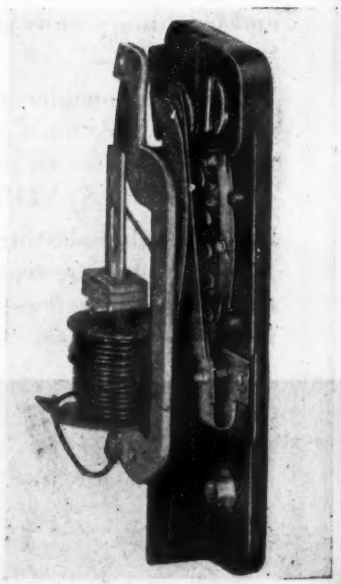


Fig. 22.

(even for a short time) or short circuit an overload in a type N or R relay, removes the protection required by the motor and, in time, the motor is apt to burn out.

Do not adjust or repair an overload device. The tripping time for solder-pot overloads in two-knob controls and bimetallic overloads in type N and R relays, and the reset time for the latter must be maintained within close limits to prevent the motor windings reaching a dangerously high temperature under unusual power or load conditions.

Illustrated here are some typical examples of overload devices adjusted or repaired in the field. The machines on which they were installed had burned motors.

The wax seals had been removed from the overload adjusting screws on the relay base shown in Fig. 22, and the screws had been turned until the overload would not trip. As a result, the relay base was badly charred in the vicinity of the heater grid.

2 TOP DEVELOPMENTS IN FLUORESCENT...TODAY

KOLD-VOLT COLD CATHODE
for Industrial Lighting

U.R.C. RESEARCH LUMINAIRE
for Commercial Lighting

Model No. 2081
MITCHELL KOLD-VOLT COLD CATHODE FLUORESCENT FIXTURE
Model No. 2032
MITCHELL U.R.C. RESEARCH LUMINAIRE
Surface or Suspension Mounting—
Individually or in Continuous Rows

Both MITCHELL

MITCHELL KOLD-VOLT Cold Cathode Industrial Fluorescent Fixture
The *first* cold cathode fluorescent in a standard *"packaged"* unit! Gives you *instantaneous starting — average lamp life expectancy 10,000 hours — greatly reduced maintenance!* 4-light fixture — 8 feet long overall — delivers a total of 8800 lumens of light. Each lamp unconditionally guaranteed for one year.

MITCHELL U.R.C. RESEARCH LUMINAIRE for Offices and Drafting Rooms
First introduced by MITCHELL. Combines the ultimate in high intensity illumination with low surface brightness (glare). Uses four 40-watt lamps. Takes less time to install than any other commercial fixture.

To get the Genuine MITCHELL Original U. R. C., look for this label!

Get complete information from your **MITCHELL DISTRIBUTOR** *or write for New Catalogs No. 278-280*

MITCHELL *Manufacturing Company*
2525 CLYBOURN AVENUE • CHICAGO 14, ILLINOIS

MITCHELL FLUORESCENT

★ BETTER WIRING FOR BETTER LIVING ★

Can too many watts spoil the cook?

WHAT'S cooking in the Bjones kitchen this morning? Well, practically nothing—as usual. (Mary's beginning to boil, but that's all).

Meanwhile, the entire family—including "Barkus," the Bjones bloodhound—is facing slow starvation.

Pretty soon, poor Bjonesy will have to skip his breakfast—and do a Dagwood down to the station to catch the 8:19 . . .

And all because Mary Bjones has to connect all her electrical appliances to a *3-way gimmick plugged into a single outlet!*

Of course, it isn't Mary's fault—there just aren't enough electrical circuits to carry the load properly. Result: appliances don't get hot enough. Cooking slows down. First thing you know, the breakfast and Mary's disposition are both spoiled.

We at Westinghouse think it's about time the Bjoneses—and the Smiths and the Browns—get a break. That's why we created the Better Homes Department . . . *to help educate home owners on the urgent need for "better wiring for better living."*

BETTER HOMES DEPARTMENT

Six Point Advisory Service

offers you free technical advice—on the selection and application of fixed electrical equipment in 194X homes—dimensions and clearances, for proper installation and easy access for servicing—placing of lighting outlets and controls—location and size of wiring, water supply and drainage lines.

Refer your electrical problems to the Westinghouse Better Homes Department. Our housing specialists will give you authoritative information, promptly.

SEND FOR THIS FREE BOOK!

"Electrical Living in 194X" takes your prospects on a *personally conducted tour* through a completely electrified home. Tells them all about increased electrical loads in future homes—modern circuit protection—lighting and lighting controls—entrance equipment and distribution panels.

Get your free copy of this 64-page book now, by writing Better Homes Department (ES-74), Westinghouse Electric & Manufacturing Company, Pittsburgh 30, Pennsylvania.

Westinghouse

Plants in 25 Cities *Offices Everywhere*

WESTINGHOUSE PRESENTS *John Charles Thomas, Sunday 2:30, EWT, NBC.*
"Top of the Evening", Mon. Wed. Fri. 10:15, EWT, Blue Network

ELECTRONICS AT WORK

Much is heard of electronics' role in the future but here is a survey of industrial applications in war production.

By E. H. Vedder*

ELECTRONIC control is now used in a variety of ways as a component part of systems which are usually partly mechanical and partly electrical. Inasmuch as many functions may be done either electrically or mechanically, careful consideration must be given to coordination of the two elements to produce the best system.

The first principle we need to establish is that electronics will live up to its publicity only if it is really put to work as an accepted workaday tool. If electronics is allowed to become a gadget business, we have failed to utilize the tool properly. The gadget angle can be avoided only by critical survey of every application. Electronic control has been developed which will do many things better, less expensively, faster, or more precisely as well as many things previously impossible. But, electronics is not a cure-all for every trouble. It is merely a new tool which must be properly used within its limitations. To illustrate the type of things for which electronics is suited, a few applications will be described.

*Mr. Vedder is manager of the Electronic Control Section, Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.

Motor Control

Many motor drive problems, particularly those connected with machine tools are best solved by the characteristics inherent in a shunt wound d-c motor. The almost universal availability of a-c power and relative unavailability of d-c power has made it much more difficult to use the desirable d-c motor for these drive applications. There has also been a growing desire for a greater nicety of control than can be readily obtained even if a d-c system is available. An electronic control has now been developed which operates a d-c motor from an a-c line and has additional desirable features not previously available. The electronic adjustable speed drive shown in Fig. 1 consists of a d-c shunt wound motor whose field and armature are energized by separate thyratron rectifier circuits. These rectifiers are so controlled as to vary the input to the motor, regulate the motor speed to a preset value, and limit the maximum current furnished the motor during acceleration and reversal.

The control permits smooth stepless adjustment of motor speed over a range of at least 20:1 below the base speed of the motor, and over an additional field control range of as much as 4:1 above the base speed of the motor. This

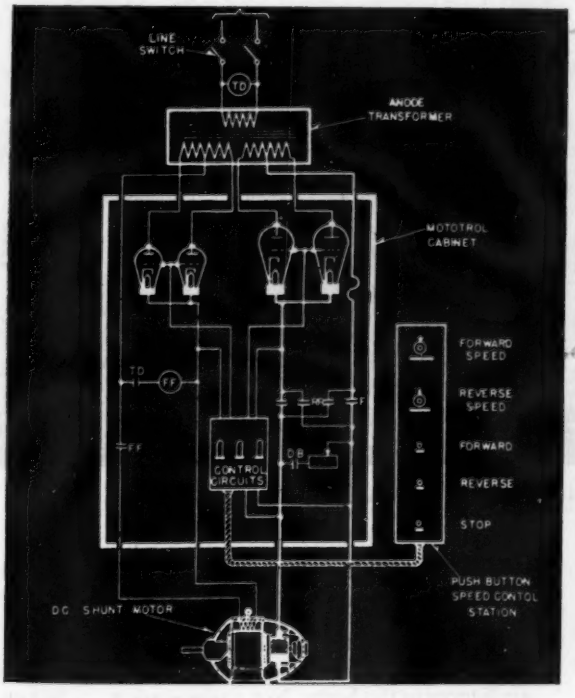


Fig. 1. Schematic arrangement of electronic adjustable speed motor drive.

Fig. 2. Application of electronic adjustable speed motor drive on capacitor winding machine.

FOR SALE

82 Billion Kilowatt Hours!

Night and day, American industry works full blast for victory

Last year the nation's power output climbed to an estimated 227 billion kilowatt hours.

That's nearly 82 billion more than in 1940.

Who is going to use this increased power production when the war ends?

We know of one peacetime market that will help take up the slack.

It's a market that's expanding with the natural desire for the leisure, luxury, and comfort that electricity can bring. A market that's building up with every dollar added to family savings.

We're talking about the use of labor-saving electrical appliances in the home. Not a new market . . . but one with new opportunities for power companies and appliance dealers alike.

All through the house . . .

Take the *all-electric home*, for instance . . . a home designed and constructed with appliances built in . . . with adequate outlets and wiring. We think many postwar homes in the moderate price range, as well as the more expensive houses, will be "all-electric" from blueprint to mortgage.

Homes already constructed will use more power, too. The *all-electric kitchen* with its refrigerator, electric range, water heater, and dishwasher; the *all-electric laundry* with its automatic washer and ironer are buying goals for many an American housewife.

And on the farm, too . . .

Still another power outlet . . . is the farm. Some 300,000 farms will probably hook on to the hi-lines each year after the war. According to the Edison Electric Institute, a farmer usually spends 30 per cent more for power than the average urban dweller. With farm incomes doubled since 1940, the rural home will probably absorb an even greater share of power production in the future.

Home surveys such as the one in Fortune magazine rank electrical appliances second only to automobiles on the list of planned postwar purchases.

But it won't pay to wait

General Electric is plugging into every one of these markets right now.

In widespread advertising we've been telling consumers, architects, builders, and bankers about the all-electric home and its place in the postwar construction picture.

We've been telling housewives about the relief from drudgery an all-electric kitchen or laundry can bring.

We've been telling farmers what a world of a difference electrification can mean to their families.

We hope you'll join us in this campaign for the increased use of power.

General Electric Appliance & Merchandise Department, Bridgeport, Conn.

FOR VICTORY

Today, General Electric is working full speed to hasten the day of Victory. *You can help, too, by buying War Bonds now.*

"Everything Electrical for After-Victory Homes"

GENERAL ELECTRIC

Tune in: "The G-E All-Girl Orchestra," Sunday 10 P. M., E.W.T., NBC —"The World Today" news, every weekday, 6:45 P.M., E.W.T., CBS.

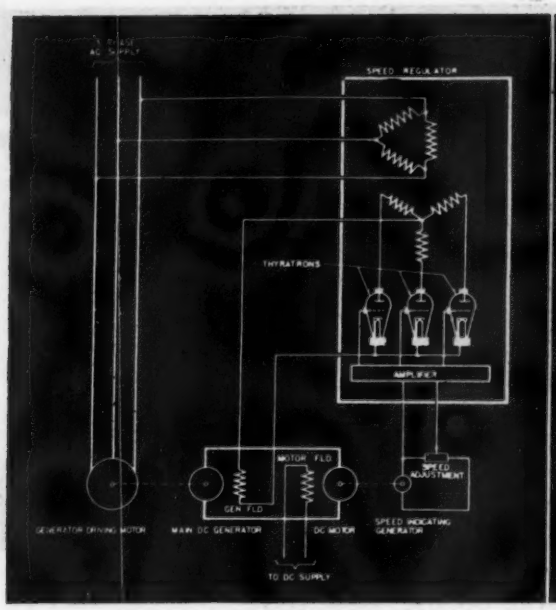


Fig. 3. Schematic diagram of a variable voltage speed control with electronic speed regulator.

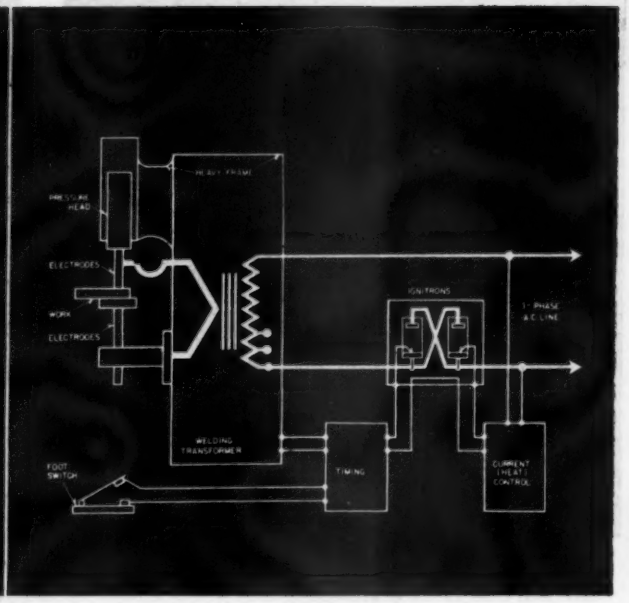


Fig. 4. Schematic arrangement of a spot welder and circuit details for electronic control.

speed control is readily obtained over the full range below and above basic speed by means of a small dial located in the pushbutton station convenient to the operator.

Combined with the wide range of speed control is the very flat speed-torque characteristics over the whole range. This is obtained by speed regulating circuits which insure that the motor will be held to the preset speed chosen by the operator. In a properly adjusted system, the speed over a 10:1 range below basic speed will not vary more than 4 per cent from a preset value with torque varying from no load to full load, nor will it vary more than 8 per cent for any speed within the speed range of 20:1. Normal variations in a-c voltage have only a small effect on the speed regulation.

There are many motor control systems where speed regulation is desired, but there is no advantage in full electronic control. For this purpose, a speed regulator system has been developed as in Fig. 3. In this particular system, the d-c motor is furnished with power by a motor-generator set. The MG set field is energized from the electronic regulator. The motor speed is indicated by the speed indicating generator whose output voltage is proportioned to speed. The indicating voltage is applied through an amplifier and regulating circuit to the grids of the rectifying tubes which furnish the generator field. This device has found ready acceptance in paper mills for regulating the speed of a single motor paper machine drive. It maintains the speed to an accuracy of approximately one-half per cent and may be adjusted over a speed range of 10:1. A similar regulator is used to hold constant speed on the Wright Field 40,000 horsepower wind tunnel drive.

Resistance welding is being extended rapidly to speed production of fabricated assemblies. It is particularly adaptable to manufacturing processes involving large quantities of repetitive assemblies. It is most commonly used on sheet metal, although

Fig. 5. A seal welding machine electronically controlled. Two fabricated halves of an airplane drop tank are joined to complete the 165 gallon rivetless tank. Welding time is four minutes per tank.

For SAFETY'S sake . . . use CONDUIT

(Full Weight Rigid Steel)

Rigid steel conduit afforded the only practical means of protecting vital electrical systems, both during construction and afterwards in this under-river tunnel.

WATER, moisture, vapors, dust and dirt may be persistent, ever dangerous enemies of even your finest wiring jobs.

The only wiring system approved by the National Electrical Code as moisture, vapor, dust and explosion proof for use in hazardous locations and occupancies is a standard-threaded rigid conduit.

For the duration, you may have to be satisfied with emergency wiring methods and substitute materials. But you can start planning now for the day not too far ahead, when full-weight rigid steel conduit will be available again, and your distributor can furnish you the always reliable YOUNGSTOWN BUCKEYE CONDUIT you want.

THE YOUNGSTOWN SHEET AND TUBE COMPANY
YOUNGSTOWN 1, OHIO
Manufacturers of
CARBON, ALLOY AND YOLOY STEELS

Ask your distributor for:
Youngstown Buckeye Conduit . . . Pipe and Tubular Products . . . Sheets . . . Plates . . . Tin Plate . . . Bars . . . Rods . . . Wire . . . Nails . . . Tie Plates and Spikes

Where there are emergency repairs to be made, electric wires to be spliced or similar jobs to be done, a lot of people would be on a spot themselves if they didn't keep Security Friction Tape always "Johnny-on-the-spot" in tool kits and on work benches.

Listen to the Philharmonic-Symphony program over the CBS network Sunday afternoon, 3:00 to 4:30 E.W.T. Carl Van Doren and a guest star present an interlude of historical significance.

UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE, ROCKEFELLER CENTER, NEW YORK 20, N. Y. • *In Canada:* DOMINION RUBBER CO., LTD.

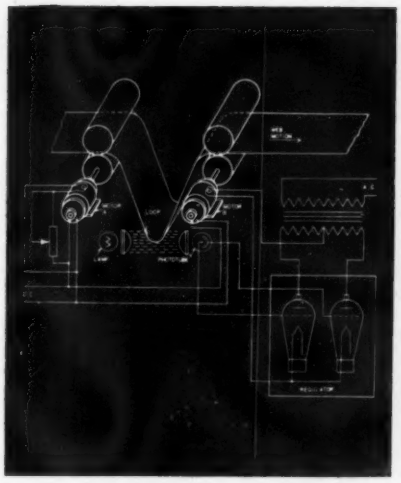


Fig. 6. Schematic arrangement of electronic control for matching motor speeds on roll drives.

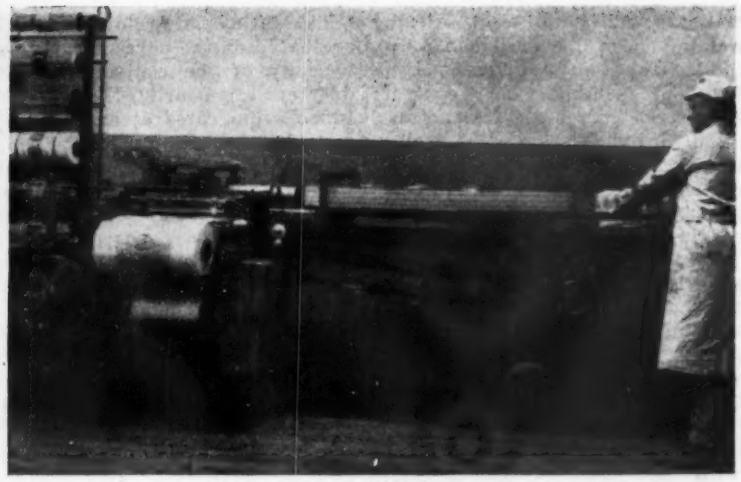


Fig. 7. Photo-electric control on this bread wrapper places trade-mark at same place on each loaf.

heavier parts including heavy plate and premachined pieces are also being welded.

Resistance welding is accomplished by passing a heavy current through two or more pieces of metal. The resistance of the metal to current flow produces heat, which fuses the pieces together. The material is clamped between copper or copper alloy electrodes which apply pressure and conduct the heavy current to the junction point. The welding machine itself consists essentially of a heavy frame work supporting a special transformer, electrodes, and pressure head for the electrodes.

For many years, the use of resistance welding was confined almost entirely to the coarser sheet steel structures which could tolerate a considerable amount of electrode marking, warping, and discoloration. The process is in recent years more of a precision process and has been extended to a variety of alloy metals such as stainless steel, brasses, and bronzes, and to non-ferrous metals of sharp fusion points such as aluminum. In wartime industries, welding has rapidly found its place in the manufacture of airplanes, trucks, shells, gasoline drums, airplane drop tanks, and other similar assemblies.

Resistance welding is divided into several different general types, the more distinct classes being spot, projection, butt, and seam welding. Spot, projection, and butt welding differ only in the type of electrodes and method of holding the materials during welding and use the same control unit. The control measures out one or more pulses of current to

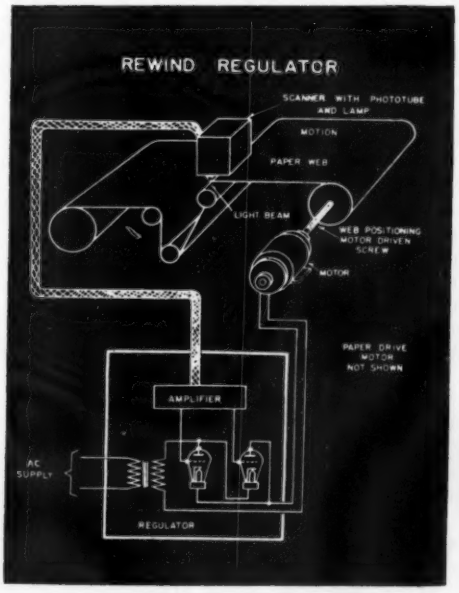


Fig. 8. Electronic edge line control for slitting or rewinding of paper, glassine, or cellophane.

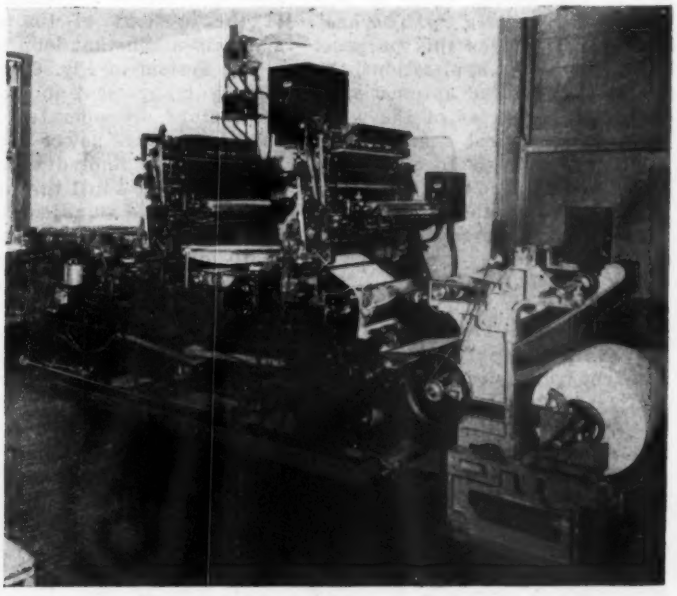


Fig. 9. A slitter regulator used on a printing press to maintain position of paper web.

make an individual weld. Seam welding uses roller electrodes, and the control is quite different than for spot welding. The control causes the current to flow in individual pulses of a few cycles duration each and with a few cycles time between each pulse for as long as welding is proceeding.

Fig. 4 shows a typical resistance welding system, showing in this particular case spot welding electrodes, although the diagram applies equally well for seam welding when roller electrodes are substituted for the pointed tips. The resistance welding system consists of the welding machine with the welding transformer mounted in it together with control equipment including an ignitron power assembly for controlling the energy fed to the welding transformer, a timing control, and the current or heat control.

When the operator's foot switch is depressed, the welding electrodes are lowered to the work and when pressure has been fully applied, the timing unit causes the ignitron unit to conduct current to the welding machine. The timing control determines the length of time that welding current will flow and after the predetermined length of time causes the current to stop. The timing is usually between one and thirty cycles.

For various work, it is necessary to have different values of current and therefore the current input to the welder must be adjusted when setting up. The heat control unit serves this purpose. For some special applications, the current is modified automatically during the progress of the weld. Electronic control has proven valuable for resistance welding because of reduced maintenance at high operating speeds and also because of the precision obtainable.

Two Systems of Welding Control

Two general types of control are available for spot welding: non-synchronous control, which is the least expensive and generally suitable for welding of mild steel where extreme precision is not desired, and the more elaborate synchronous control used for precision welding all kinds of alloys and non-ferrous metals. It is also used where precise welding of mild steel is required. For seam welding applications only synchronous control is recommended.

The ratings of welding control are based on the current carrying capacity of the control and the duty cycle primarily, the ignitron tubes being rated at currents up to 10,000 amperes during the weld at low duty cycle. Inasmuch as the welding transformer steps current up several times, this value of primary current would correspond to perhaps 80,000 or 100,000 amperes in the weld itself. Most equipment operates from industrial voltages of 200 or 440 volts, although control is now available for 2300 volt operation. The high voltage operation is particularly desirable for large welding machines to minimize the effect of the high current demand on the line voltage and in many cases save on the amount of bus required for feeding the power to the machine.

Control Using Light

This control is called photo-electric because it is actuated by the response of a light sensitive element called a photo-tube. Photo-electric control is useful for actuating a system in response to a change of color, shade, density, shape, or position without mechanically touching the controlling object.

Many of the more important photo-electric applications may be classed as process regulators. Thus, a loop regulator on a paper coating or steel strip mill watches the loop position and calls for slowing down or speeding up one of the sections of the mill to maintain a constant loop.

The system in Fig. 6 is a simplified arrangement and when the d-c motors are operated from a constant voltage power supply the web speed is limited to a maximum range of 4 to 1 through field control. Should an adjustable voltage system be used, a speed range of 10 to 1 and higher may be obtained. An additional speed range is obtained through the combination of voltage and field control. The web is driven by motor A into the loop and taken out of it by motor B. Motor A and motor B can, for instance, operate two different sections of a conveyor or two separate stands of a mill. The speed of motor A is adjusted as desired and the regulator then keeps the speed of motor B at the proper value to maintain a constant loop between the two sections. An increase of loop length reduces the amount of light reaching the photo-tube from the light source and modifies the field excitation of motor B, adjusts its speed, and brings the loop back to the proper position.

A regulator used frequently in the paper, cellophane, and glassine processing industry is that for maintaining the position of cut when taking from a roll of preprinted stock for making bags or packages. Although the machine feeds paper at a rate approximately correct to match the speed of the rotating knife, cut will never remain registered perfectly without either manual or automatic supervision. A register regulator corrects for changes of paper slippage, stretch, and speed relative to the cutter speed. The position of the printed material is indicated by a rectangular register mark in the design or margin which is scanned by a phototube. The position of the mark with respect to the cutter is checked and the speed of paper feed modified if necessary.

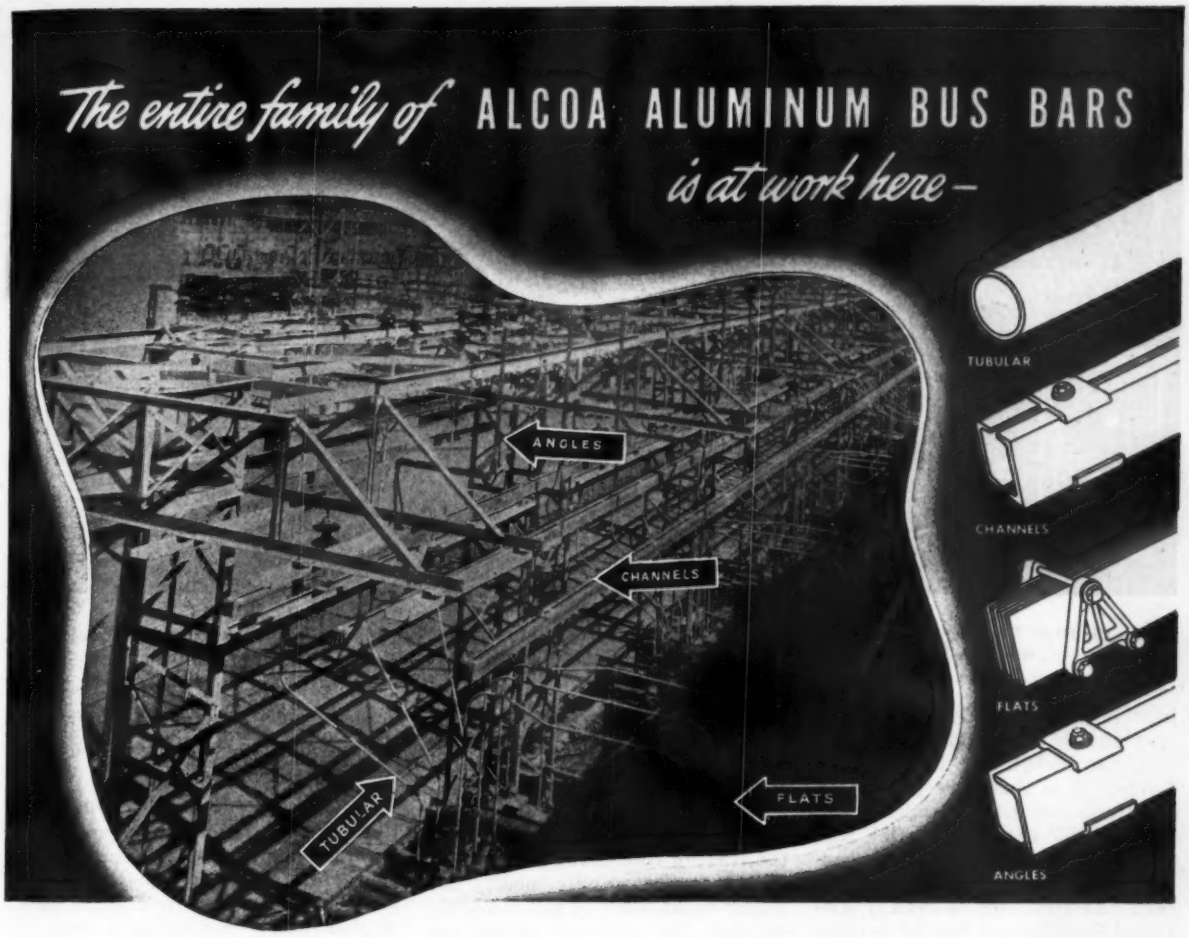
When slitting strip material, it is often necessary to regulate the sideways position of the web to insure cutting at the proper point relative to a trademark or printed design. The slitter regulator in Fig. 8 scans the edge of the paper web or a line in the printed design. The proper web position is obtained by moving the roll of material to the position called for by the phototube in the scanning device. The same device is used to scan the edge of a web and correct the roll position to insure smooth roll wind-up when rewinding mill rolls.

Flowing of Tin Plate

The wartime shortage of tin brought about the necessity for thinner coating of tin on strip steel for cans. This has been accomplished by the electrolytic tinning process. The electroplating process leaves the tin surface with a silvery appearance and somewhat porous structure. It is necessary to heat the strip enough to melt and flow the tin, and thus obtain a more perfect coating. Not only does an electronic high frequency oscillator supply power for flowing the tin after electro-plating, but it is also necessary to regulate the flowing of the tin so that exactly the right amount of high frequency power is furnished and thus avoid spoilage.

If too much power is furnished to the high frequency induction

The entire family of ALCOA ALUMINUM BUS BARS *is at work here—*



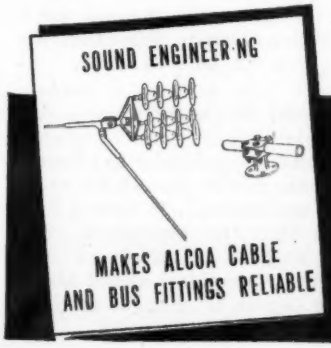
High in electrical conductivity, light in weight, corrosion-resistant, easy to handle; the designers took full advantage of these properties of aluminum in this industrial outdoor substation. Alcoa Aluminum bus bar shapes—channels, angles, flats and rounds—enabled them to meet all mechanical requirements most economically.

Vital wartime electrical loads are being carried by Alcoa Aluminum bus bars in every type of industry. Generating plants and substations, mills and factories, office buildings, battery rooms in telephone and telegraph systems; all are being supplied with power by these efficient, easy-to-maintain bus bars.

Now that the supply of aluminum exceeds the demands for military uses, Alcoa Aluminum bus bar shapes and fittings are again available. WPB Order M-1-i now permits the use of aluminum for electrical conductors. Users will find that, in installing aluminum bus bars, fewer man-hours are required. The lighter weight of aluminum makes transportation, handling and erection easier.

If you are considering the installation of new bus bars, or the extension of an existing system, consult Alcoa.

Our engineers are anxious to serve you. Write ALUMINUM COMPANY OF AMERICA, 2164 Gulf Building, Pittsburgh 19, Pennsylvania.



ALCOA
ALUMINUM

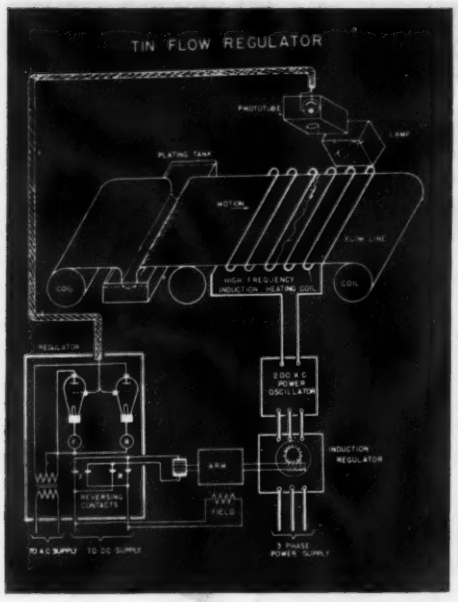


Fig. 10. High frequency oscillators furnish the heat for this new tin flowing process.

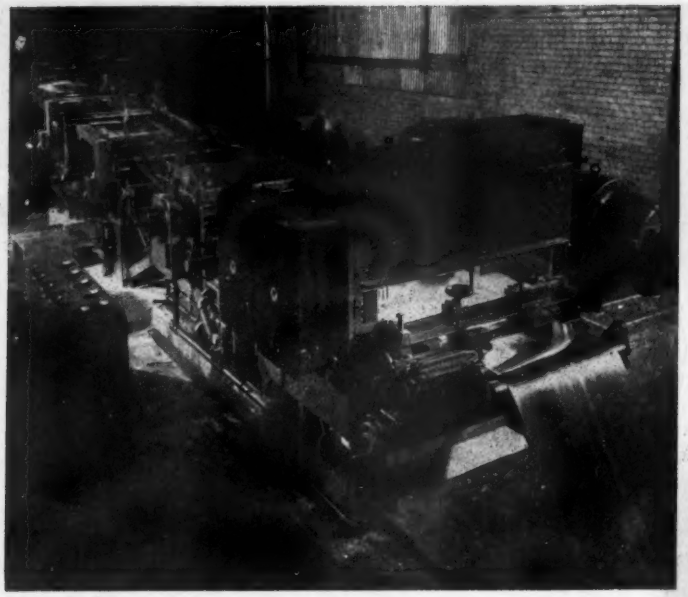


Fig. 11. In the foreground is the electronic pin hole detector in a steel strip shearing line.

heating coil, the flow line will occur much earlier in the heating coil than it would at lower power levels. It is therefore desired to maintain the power input to the heating coil at a level which will cause the tin to flow at a certain predetermined position in the coil. The flow line is readily distinguished because the tin coming directly from the plating tank has a very diffusing surface whereas that tin which has been flowed has a mirror surface.

The regulating system is shown in Fig. 10 with a light source and photo-tube scanning the plated strip. The scanner detects the exact line at which this change of condition occurs. If the speed of the tinning line changes it is necessary to accordingly modify the power input. This is accomplished through the scanner which observes that the position of flow line has changed and, through the regulator, energizes the induction regulator motor so as to increase or decrease the amount of power and bring the flow line back to the proper position.

Not all photo-electric applications are for regulation purposes. An important steel mill application of another type is that for detecting holes in strip steel. This application is particularly desirable on steel which will be used for the canning industry. Prior to the use of pin hole detectors, it was difficult to visually inspect the strip effectively and food spoilage resulted. The pin hole detector, Fig. 11, will inspect steel strip at speeds up to 1,500 feet per minute and detect 1/64" or smaller holes. The detector operates a marker which places a visible mark on the strip at the location of the hole so that it can be readily located later on. In many installations, the detector also operates a classifier to automatically reject defective sheets after they have gone through the shear which usually immediately follows the pin hole detector.

The pin hole detector is probably one of the more prominent commercial applications of sorting. Much loose publicity has been given to the use of photo-tubes for sorting applications. It should be realized that the photo-tube responds only to a difference of light energy reaching it and also in some degree to changes of the

(*Continued on page 65*)

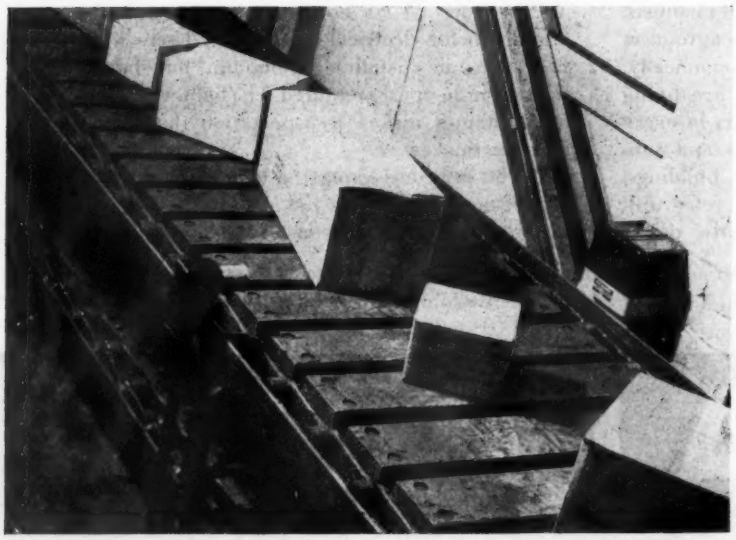


Fig. 12. One of the earliest electronic applications in industry was the electronic counter for conveyor lines.

News today that means sales tomorrow

WINTER FORECAST: GOOD EATING AHEAD!

All together now . . let's can, brine, dry or freeze every extra speck of food from our Victory Gardens and farms. It will assure good eating next winter, in spite of any food shortages. Save the surplus . . . make Food Fight for Freedom.

Then pause and dream of the tomorrow when you can eat what you want regardless of harvest dates or seasons. When you'll take fruits and vegetables at the height of their sun-ripened goodness, pop them into your Westinghouse Home Freezer . . . and serve them when you will. When rare game and out-of-season foods can be the high spot of your dinner any time of year. When you'll serve today's leftover roast in a heart-warming dish, a month, even 2 months, from now. Dream of the day when exotic foods from all corners of the world . . famous cooked dishes from restaurants in Quebec or New Orleans, Rio or Bombay . . can be stored in your freezer ready for your whim to eat them.

Thrill over the gas when you can bake the rolls and berry pie, cook the potatoes au gratin and chicken á la king, now . . . and serve them days, perhaps weeks later.

Pipe dreams? Not on your life! We at Westinghouse know how that they'll all come true. For when the war is over, we will again build a proud line of electric home appliances. And a new shining star for both city and farm will be the Home Freezer.

Meantime . . . let's all get busy and save the surplus. To help you we have a complete 48-page "Home Canning Guide." Get your free copy, write the Westinghouse Home Economics Institute, Mansfield, Ohio.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO., MANSFIELD, O.
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Coming . . a New Westinghouse Home Freezer for Postwar!

30 MILLION PRE-WAR
Westinghouse
ELECTRIC HOME APPLIANCES
ARE YOUR POSTWAR PROMISE
OF STILL FINER ONES TO COME

Tune in: John Charles Thomas • Sunday 2:30 EWT., N.B.C.
"Top of the Evening". Mon. Wed. Fri. 10:15 EWT., Blue Network

This full-page, full-color message . .

1. APPEARS IN THESE MAGAZINES . . . Saturday Evening Post, August 19 (out Aug. 16); Collier's, September 2 (out Aug. 25); Good Housekeeping, September (out Aug. 20)
2. SAYS TO YOUR CUSTOMERS "Coming...a new Westinghouse Home Freezer for postwar"

For further information about Westinghouse Appliance postwar plans, ask your distributor to show you the new presentation, "On Your Mark—Get Set."

NEWS of the INDUSTRY
National and Southern

Cancellation Urged for Unnecessary Meetings

The immediate cancellation of all non-war connected conventions, trade meetings and conferences as well as non-essential civilian travel was demanded early in June, by Director J. Monroe Johnson, of the Office of Defense Transportation.

"With the invasion now actually under way, the demands on the transportation facilities of the country are increasing, not decreasing," Col. Johnson stated. "The pressure of rail shipments of war material has not yet reached its peak. Organized troop movement combined with increased casualty transportation is gaining record-breaking proportions. The hardship involved in the cancellation of business meetings involving travel cannot be compared with either the outright danger such non-essential travel imposes on the war effort nor with the very real physical hardships now being experienced by our military forces."

Col. Johnson also announced that he is asking the chairmen of both House and Senate appropriation Committees as well as the Bureau of the Budget to take firm measures to insure the immediate curtailment of governmental travel, particularly in connection with conventions, and other trade meetings.

"The test of whether a particular convention, meeting or any use of the passenger facilities of either railroads of inter-city buses is of vital and immediate importance to the war lies in the heart of every patriotic American," Col. Johnson said. "In this hour of the greatest and gravest demands on every human and industrial resource of the nation, I do not think it too great a sacrifice to ask that our transportation system be reserved for the use of the military, sorely needed tools of victory, and essential governmental business."

Learn by doing was keystone of the many successful field schools established by Frigidaire Division of General Motors. Students work on actual refrigeration products, quickly learn the "feel" of tools and servicing procedures.

Frigidaire's Wartime Service Training

Marked by the training of 2,000 men at 75 District Schools, plus an enrollment of some 5,000 dealers and servicemen in Primary and Post-Graduate Correspondence Courses, Frigidaire 1943-1944 Fall and Winter Wartime Service Training Program has proved extremely successful in the opinion of P. V. Sprout, Frigidaire's service manager. Full credit for this contribution to the war effort on the refrigeration front is given by Mr. Sprout to the cooperation and effort of the Frigidaire dealer organization.

Tracing the steps which lead to the results reported, Mr. Sprout points out that in order to make certain that the fine record achieved during 1942 and 1943 would be continued, the Frigidaire Division of General Motors Corporation took steps to intensify and expand its service training operations to meet the ever increasing demand for qualified servicemen and to supply the need for essential repair and maintenance service.

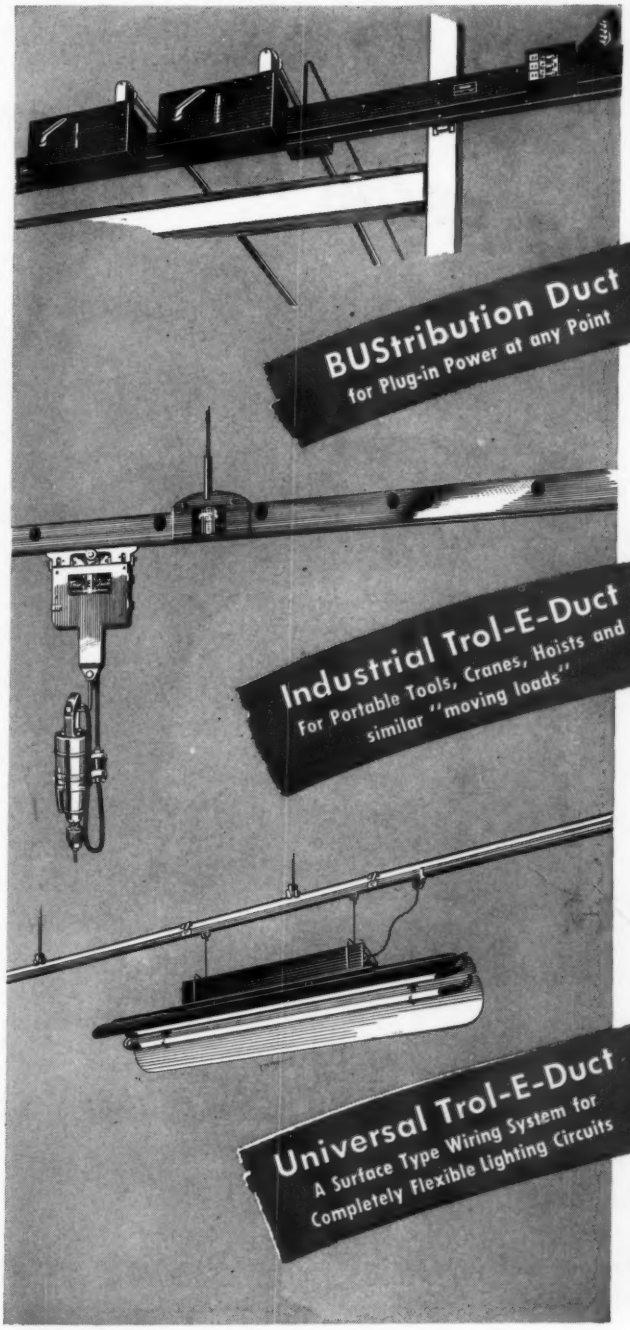
"The problem we faced was all the more difficult in view of the diminishing manpower supply," says Mr. Sprout. "and the fact that the millions of Frigidaire installations in daily use were all a year older."

"During the recent training season alone, approximately 2000 men will have attended seventy-five district schools." Duration of these schools varied from a few days up to one month and they offered highly organized instruction in fundamental and advanced classes in household, commercial

3505 BULLDOG INSTALLATIONS

In America's Largest Manufacturing Plants

WILL SPEED RECONVERSION


BUStribution Duct
for Plug-in Power at any Point
Industrial Trol-E-Duct
For Portable Tools, Cranes, Hoists and similar "moving loads"
Universal Trol-E-Duct
A Surface Type Wiring System for Completely Flexible Lighting Circuits

BullDog Duct . . . for power and light . . . will help in Peace Production Race

In thousands of *major* U. S. war plants, new and old, BullDog Electrical Systems have saved countless hours on installation and maintenance — greatly reduced changeover time — helped keep production at top speed and efficiency.

How? By making plug-in power immediately available for any shop set-up. By bringing power close to portable tools on any type of production line. By putting light close to the work on any kind of operation.

An Asset in the Postwar Race

When these BullDog-equipped plants get the go-ahead for reconversion they will again be out in front in the production race — and for the same reasons. Their flexible electric systems will be ready for even the most sweeping changes of product, plant layout or tool set-up.

To manufacturers—large or small—who have not yet installed this modern method of power and light distribution, BullDog offers the services of expert field engineers, to help in planning postwar operations.

Write now for complete descriptive material on BullDog BUStribution DUCT, Universal Trol-E-Duct, Industrial Trol-E-Duct and other BullDog products.

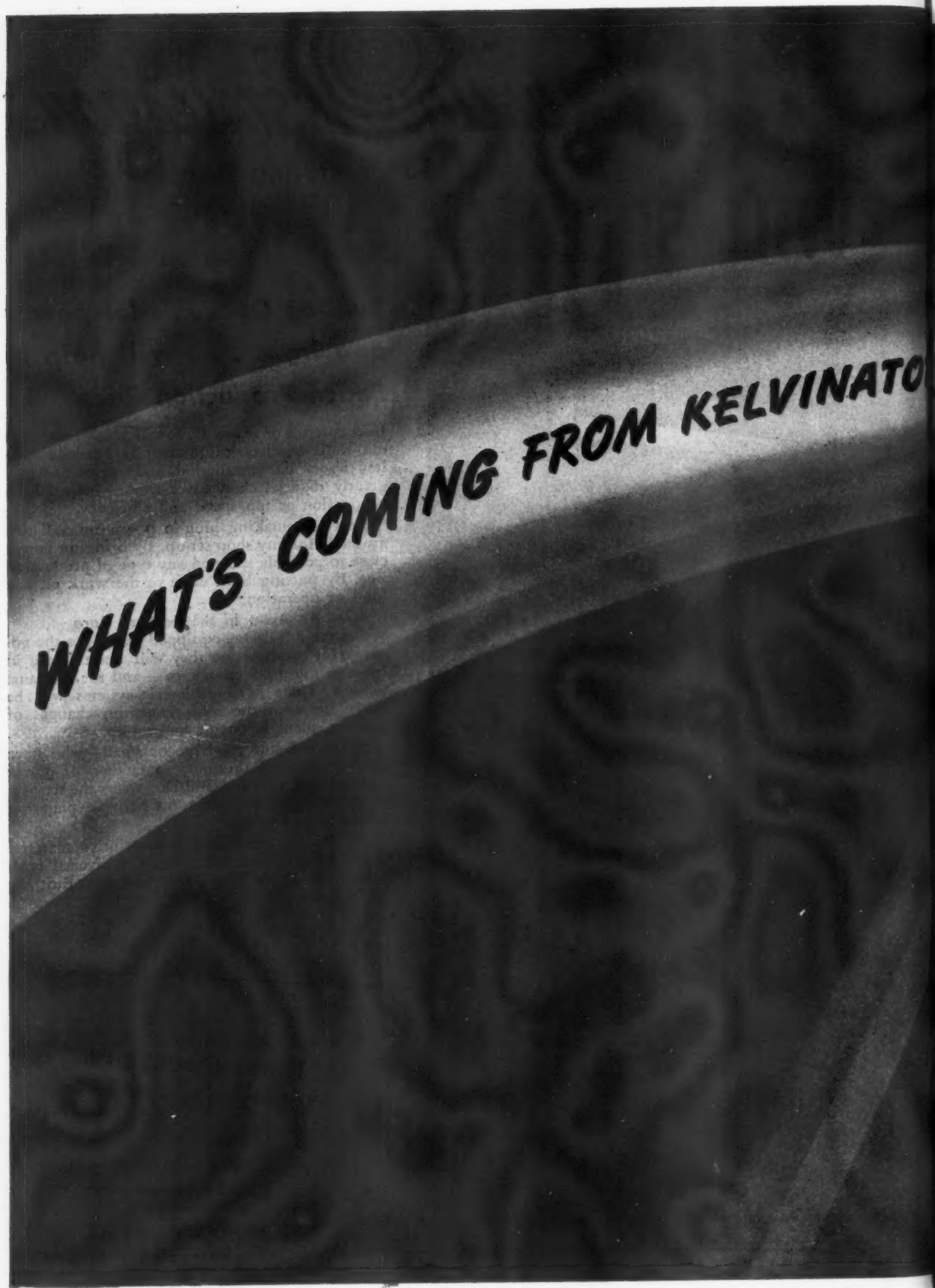
Buy Bonds to the Limit in the Fifth War Loan

BULLDOG
ELECTRIC PRODUCTS CO.

BOX 177, R. PK. ANNEX
DETROIT 32, MICHIGAN
BullDog Electric Products of Canada, Ltd., Toronto, Ont.

Field Engineering Offices in All Principal Cities

ALSO MANUFACTURERS OF
VACU-BREAK SAFETY SWITCHES • SWITCHBOARDS
SAFTOFUSE PANELBOARDS • CIRCUIT MASTER BREAKERS


WHAT'S COMING FROM KELVINATO

Realizing that electric utilities, generally, face a tremendous task in building up their domestic load in the first postwar years, Kelvinator will offer more than a complete line of Refrigerators, Home Freezers, Electric Ranges and Water Heaters.
Here at Kelvinator we are already at work formulating long-range merchandising plans that will help utilities get these load builders into owners' homes where they will do their part in increasing current consumption on domestic lines.
Full details will be announced at the proper time.
LOOK AHEAD WITH KELVINATOR
DIVISION OF NASH-KELVINATOR CORPORATION
Awarded by Nash-Kelvinator Corporation, Propeller Division

P. V. Sprout

supervision of experienced factory and district instructors.

More than 5000 special Primary and Post-Graduate courses have been distributed. The 24-lesson Primary Course can be taken by the students as pre-training before employment. The 12-lesson Post-Graduate Course is designed for experienced men. Here again the objective is the thorough training of manpower in the minimum space of time

Having learned the value of this service training program in 1942, when Frigidaire's wholesale education movement first got under way, the dealer organization spared no effort to help make this new concerted effort a signal success. Although the training program was essentially for the winter months to prepare for the critical warm-weather periods, requests for the Service Correspondence Course lessons were continued throughout the year. Both day and night classes were held and numerous dealerships used newspaper advertising to enlist men for training and service work.

Wiring Bureau Will Expand Program

An expanded program of consumer education on the practical aspects of electrical operation in the post-war home, has been announced by Herbert Metz, chairman of the Executive Committee of the National Adequate Wiring Bureau. The program is to parallel the Bureau's recently announced activity, directed to the building industry.

"A rising tide of public interest in post-war home planning has created an urgent need for simple, down-to-earth educational material which will meet the requirements of electrical industry personnel, now being called upon to answer consumers' questions", said Mr. Metz. "The rapid growth of Home Planners' Institutes, sponsored by home financing agencies and trade associations within the home construction industry, is putting a demand upon the educational facilities of electrical utilities, electrical leagues and the like, and the Bureau's new educational program is designed to help the electrical industry meet this demand."

Mr. Metz stated further that National Adequate Wiring Bureau headquarters is prepared to give all possible assistance to electrical industry groups in setting up educational activities, built around successful programs now under way. Several of these are described in the current issue of the Adequate Wiring Reporter.

The "A B C" of
ADEQUATE
WIRING
A Adequate Entrance for Electric Service
B Adequate Circuit Capacity
C Adequate Provision for Outlets, Lights and Switches

An important adjunct to National Adequate Wiring Bureau's expanded consumer education program is the use of lecture charts in group meetings. A set of 19 charts, measuring 22"x34", has been made available by the Bureau for this purpose.

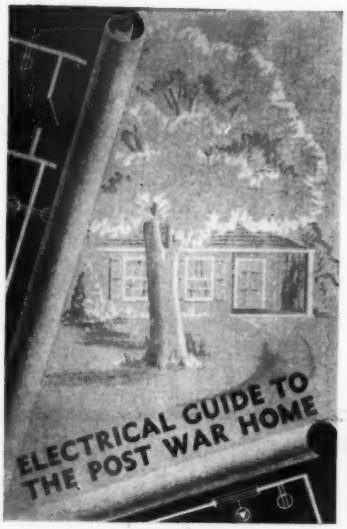
A new set of lecture charts, for use from the platform, and a 16-page booklet, both entitled "Electrical Guide to Your Post-War Home" form the nucleus of the Bureau's suggested program. The program was presented to several groups of electrical industry commercial executives and home service directors before the material was put in final form, in order that it would be certain to meet the requirements of the industry.

The reception being given to this program is evidence that all branches of the industry are fully aware of the need for giving the public information now about the vital nature of electrical planning for post-war home building and modernization.

The charts and the booklet introduce electric service as the element upon which a house must depend if it is to function as a home. They show that any home, in any size or price bracket, depends either wholly or partially on electricity for eight necessary functions. There are: illumination; cleaning and sanitation; meal preparation and food storage; heating, ventilating and air conditioning; entertaining and hospitality; education, recreation and hobbies; health protection and personal care; utility, safety and protection The charts and the booklet point out that even the smallest wired home uses at least one piece of electric equipment in each of these classifications.

The ABC's of Adequate Wiring are presented in relation to the benefits to be derived from a well planned electrical system. A suggested script of detailed stage directions accompanies each set of charts, in order that they may be used with equal effectiveness by experienced as well as relatively inexperienced lecturers.

The booklet is so designed that it can be used equally well for distribution at group meetings where the chart lecture has been pre-

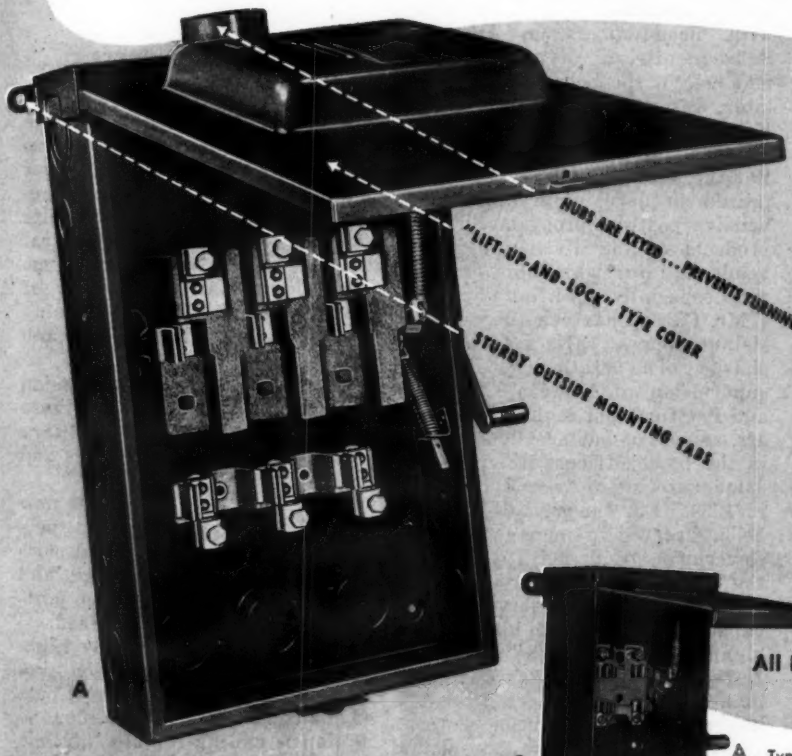


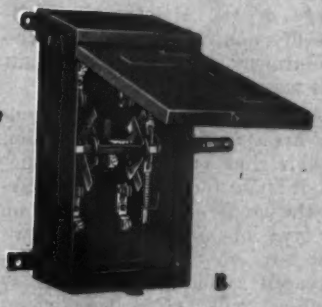
Front cover of the 16-page, two color booklet just announced by the National Adequate Wiring Bureau as an item in its expanded consumer education program.

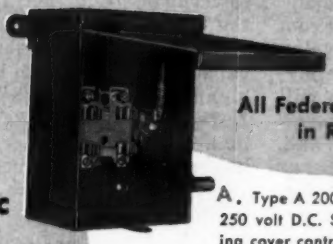
let it rain...let it pour...

Federal **RAIN-TIGHT SWITCHES**

eliminate moisture worries







All Federal Switches are available in Raintight Enclosures

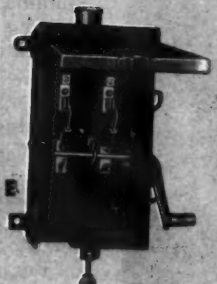
A. Type A 200 amperes 3 pole 230 volt A.C.—250 volt D.C. Switch. Equipped with interlocking cover control.

B. Double-throw 60 amperes 250 volt D.C. Safety Switch.

C. Type C 30 amperes 2 pole cartridge fuse 230 volt A.C.—250 volt D.C. Raintight Switch.

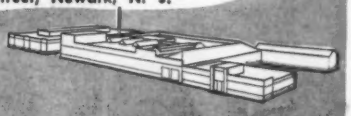
D. Type C 60 amperes 330 volt A.C.—250 volt D.C. All type C concealed arc switches are equipped with shock resistant Hemite bases.

E. Type C 100 amperes, 2 pole, 250 volt D.C., no fuse Raintight Switch.



Federal **ELECTRIC PRODUCTS COMPANY**

50 Paris Street, Newark, N. J.



CIRCUIT BREAKERS • PANELBOARDS • SWITCHBOARDS • SAFETY SWITCHES

3671

sented, or by mail to selected lists of consumers. The National Adequate Wiring Bureau suggests the use of couponed advertisements as one means of getting the booklet into the hands of interested customers, in those areas where group meetings have not yet been organized. Complete information regarding consumer programs now under way can be obtained from the National Adequate Wiring Bureau, 155 East 44th Street, New York 17, N. Y.

New Sales Assistants Named by Kelvinator

In a move toward the postwar expansion of home office operations and executive responsibilities, Charles T. Lawson, Nash-Kelvinator vice president in charge of the Kelvinator appliance division, has announced the appointment of three assistant sales managers.

"Although many of our executives are spending a major portion of their time on our war production, it is not too early to start taking the steps necessary to set up the type of an organization we must have to handle the greatly-increased volume of business which we expect to do in the years following the war," the announcement stated. "This move is made with that objective in view. From these appointments will develop highly-specialized and completely-contained departments which will enable us to broaden and intensify our various sales activities and, in doing so, better serve both our wholesale and retail selling organizations. We look for several years of peak refrigerator volume, a rapidly-expanding market for electric ranges and an opportunity to obtain a larger share of the market for commercial as well as new household products."

The appointments made cover three important sales activities of the Kelvinator Division. The three new assistant general sales managers and their divisions are: E. R. Legg, Commercial Sales and Contract; T. A. Farrell, Sales Operations; and D. A. Packard, Household Products Merchandising.

With Kelvinator since 1927, Mr. Legg had many years of field selling experience before his appointment in 1934 to the post of manager of National Direct Division with headquarters in Detroit. Subsequently, he was named sales manager of the Leonard Division, later western sales manager for Kelvinator, and from 1941 to early 1943, household sales manager. For the past year, Legg has specialized in developing a comprehensive postwar program for the products of the division he now heads and for which his experience especially qualifies him.

Mr. Farrell has been named assistant general sales manager in charge of operations including supervision of Eastern, Western and Pacific Coast regional managers, as well as business operations in the home office. He first became associated with Kelvinator in 1939. For the past 2½ years, he has served as manager of the Government Contract Division of the Corporation and for the present will continue to serve in this capacity in addition to his new assignment. Prior to the war, Farrell was manager of the Commercial, Parts and Service Division and previously had been eastern sales manager of the household division.

D. A. Packard, in his new capacity as assistant general sales manager, will be directly responsible for sales and merchandising activities on all Kelvinator household products. Packard's long experience in working closely with appliance retail outlets of every type forms an excellent background for the new and important activities to come under his direction in his new post. He has been with Kelvinator since 1940 and has served as eastern sales manager for the past few years. His new duties will include direct supervision of all merchandising activities including franchising, sales strategy and sales training plans.

E. R. Legg

T. A. Farrell

D. A. Packard

Illuminating Engineers To Meet in Chicago

A technical conference of the Illuminating Engineering Society will be held at the Edgewater Beach Hotel in Chicago on September 14, 15, and 16. This site was chosen because the central location will cut down travel time and mileage for the majority of our members. The papers being scheduled are wide in scope and interest.

Within the limits of discussion provided by the authorities there will be presented some military developments in light sources and equipment.

In the residential field our new standards of illumination performance for luminaires and portable lamps, will be presented, and the application of light to postwar housing will be discussed.

The construction of new highways and traffic separation projects in cities as an important part of our country's post-war economic plan is calling for new data on the lighting of these traffic ways. A report of the Street Lighting Committee on the revision of our "Recommended Practice of Street Lighting" will be presented.

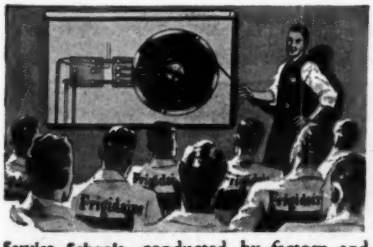
For the industrial lighting field there will be presented some valuable data on lighting methods and luminaire design to increase visibility and comfort, and reduce eyestrain of factory workers.

The necessity of harmonizing the colors of interiors with the lighting plan is being recognized as of increasing importance as new light sources have become available for general use. A new approach to the problem is being developed and will be presented.

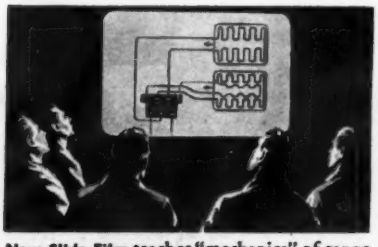
For the first time, basic concepts of brightness and footcandles will be presented as a guide for the industry.

Range Service Training Helps Frigidaire Dealers Build For The Future

This 88-page POCKET-SIZE Guide*—profusely illustrated—provides the range serviceman with complete reference data to take on the job with him.



Service Schools, conducted by factory and district personnel, give complete training on servicing Frigidaire Ranges.



New Slide Film teaches "mechanics" of range servicing and the "important trifles" of range operation from housewife's viewpoint.

Factory and District Range Service Specialists provide valuable field help and guidance for Frigidaire service personnel.

This complete Training Program is enabling Frigidaire Dealers to provide effective Range Service in the face of acute manpower shortages and other wartime problems. The resulting backlog of good will among users of Frigidaire Electric Ranges will be reflected in new and greater sales opportunities for Frigidaire Dealers in the great peacetime future that lies ahead.

*This New Reference Guide is extremely popular among Frigidaire Range Servicemen. Although small enough to be carried in the pocket—it is so complete, with many of the diagrams and illustrations produced in full color—that even experienced range servicemen find it a valuable help when called upon to service Frigidaire Ranges.

For Excellence ARMY NAVY *in War Production*

FRIGIDAIRE
Division of
GENERAL MOTORS
DAYTON 1, OHIO • LEASIDE, ONTARIO
Peacetime builders of
ELECTRIC REFRIGERATORS • RANGES • WATER HEATERS
HOME FREEZERS • ICE CREAM CABINETS
COMMERCIAL REFRIGERATION • AIR CONDITIONERS
BEVERAGE, MILK, AND WATER COOLERS

HOW STEEL ~~STRETCHES~~ THE SYLVANIA LINE OF "COMPLETE PACKAGES OF LIGHT"

Government release of steel for fluorescent fixture fabrication enables Sylvania to round out its line of "complete packages of light" to fit all industrial and commercial general lighting requirements.

Now there are SEVEN INDUSTRIAL UNITS

Continuous-Row Type

Back into the line come these outstanding Sylvania Fixtures with steel reflectors, designed primarily for continuous-row or end-to-end installations. They are made with the same high quality materials available in 1942.

Single (4-foot) channel top-housing

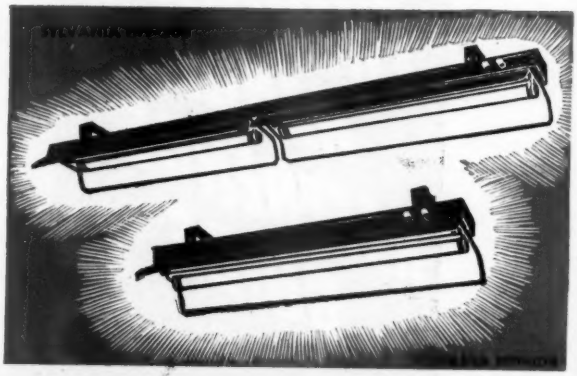
HFF-104—two 40-watt lamps, for continuous-row mounting
HFF-154—three 40-watt lamps, for continuous-row mounting

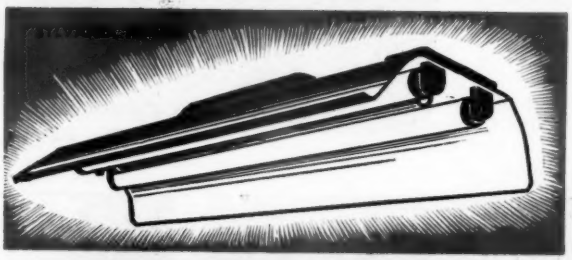
Double (8-foot) channel top-housing

(Continuous wire-way enclosure reduces cost of continuous-row installations)

HFF-208—four 40-watt lamps, for continuous-row mounting
HFF-308—six 40-watt lamps, for continuous-row mounting

All models come completely equipped with lamps, ballasts, and starters — pretested and ready for immediate installation.





All-Purpose Type

The famous Sylvania "Fixture of the Future," which has proven so popular in war industry, is now available with a reflector drawn from 20-gauge steel, with a reinforcing lip. Finished with durable synthetic enamel. For either continuous-row or individual mounting.

HF-100S steel reflector has knockouts that provide for easy conversion from two to three lamps. The streamlined top-housing in all models has knockouts that make almost any type of mounting possible. Supplied in "complete packages of light" with lamps, starters, and ballasts, pretested, wired, and ready for immediate installation.

HF-100S—two 40-watt lamps
HF-150S—three 40-watt lamps
HF-235S—two 100-watt lamps

SYLVANIA

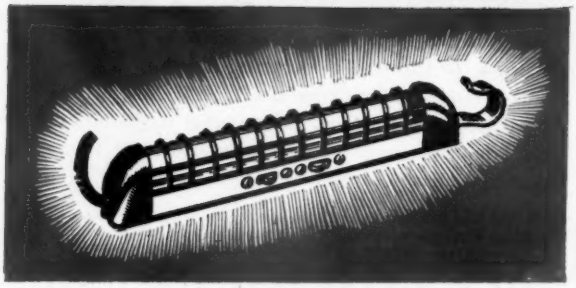
ELECTRIC PRODUCTS INC.

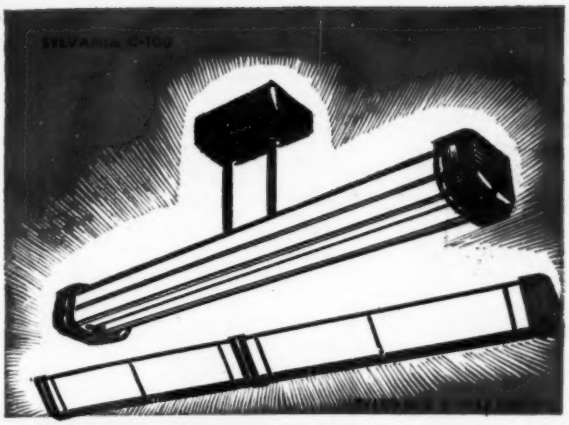
Salem, Massachusetts

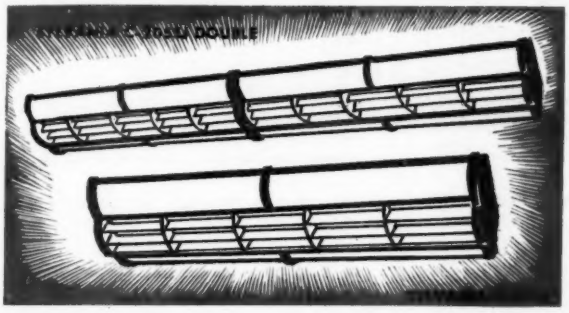
Fluorescent Lamps, Fixtures and Accessories, Incandescent Lamps, Radio Tubes, Cathode Ray Tubes, Electronic Devices

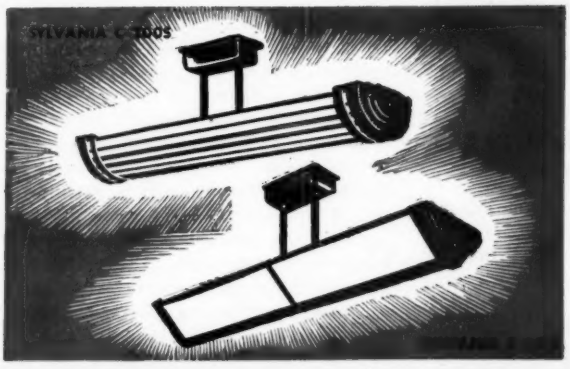
Portable FLUORESCENT WORK LIGHT FOR INDUSTRY

P-7 Sylvania Extension Cord Lamp makes fluorescent light portable for the first time. Compact dimensions — 10¼" x 1 3/16" x 1⅞". Goes anywhere the hand can reach in close-quarter work. Cool and adequate light from a 6-watt Sylvania Fluorescent Lamp is safe and efficient. Steel guard prevents lamp breakage. Handy hook leaves both hands free to work. Operates on 110-125 volts, 60-cycle, AC only.









Now there are SEVEN COMMERCIAL UNITS

Two-Lamp Shielded and Unshielded

It is now possible to resume the manufacture of this handsome and adaptable series. All models have steel reflectors and employ 40-watt lamps. This variety of models will make for wider fluorescent application to the commercial and institutional field.

Two 40-watt Lamps

C-100 unshielded with pendant
C-101 shielded with pendant
C-113 unshielded surface-mounted
C-115 shielded surface-mounted

All models are supplied with Sylvania Lamps as "complete packages of light."

•

Louver Type

These highly efficient fixtures are decorative in appearance but functional in design, with diffusing panels on each side of the lamps and louvers directly beneath. Equipped with four 40-watt lamps. Steel reflectors.

Four 40-watt Lamps

C-205S individual surface-mounted

•

Four-Lamp Shielded and Unshielded

These Sylvania Fixtures, which are ideal for stores, offices, laboratories and hospitals, now are equipped with 20-gauge steel reflectors finished with synthetic enamel. New design hinged end-caps and hinged diffusing panels make for easier and speedier maintenance. Supplied complete with four 40-watt Sylvania Fluorescent Lamps, Dua-Lamp Auxiliaries, and Starters — pretested and ready for immediate installation. Available with or without pendant.

Four 40-watt Lamps

C-200S unshielded, surface-mounted, individual
C-201S shielded, surface-mounted, individual

Leading Manufacturer of Fixtures in the Fluorescent Field

IF YOU HAVE A PROBLEM TO WHICH FLUORESCENT LIGHT MIGHT BE APPLIED, WHY NOT CONSULT SYLVANIA ENGINEERS?

SYLVANIA "COMPLETE PACKAGES OF LIGHT"

Industrial Fixtures		*Commercial Fixtures*	
HFF-104	( )	C-100	( )
HFF-154	( )	C-101	( )
HFF-208	( )	C-113	( )
HFF-308	( )	C-115	( )
HF-100S	( )	C-205S	( )
HF-150S	( )	C-200S	( )
HF-235S	( )	C-201S	( )
P-7	( )		

SYLVANIA ELECTRIC PRODUCTS INC., Boston Street, Salem, Mass.
Dept ES---744

Please send me information on the fixtures I have checked.

Name_____

Title_____

Firm_____

Address_____

City_____ State_____

Virginia Utilities Complete Merger

Effective May 25, 1944, the properties of the Virginia Public Service Company were merged with the Virginia Electric and Power Company, which maintains headquarters in Richmond. The Virginia Public Service Company served a considerable area in the western part of Virginia, including the cities of Alexandria and Charlottesville.

The following statement on the merger was issued jointly by J. G. Holtzclaw, president, and W. E. Wood, executive vice president:

"We are pleased to announce that all steps necessary to consummate the merger have been successfully completed and it became effective as of midnight May 25, 1944.

"The merger has been actively under consideration since the summer of 1943 by the officers and Boards of Directors of both companies and by the Securities and Exchange Commission, the Federal Power Commission, the the State Corporation Commission of Virginia, the Utilities Commission of North Carolina and the Public Service Commission of West Virginia. All of these Commissions have approved the merger and it was approved by an overwhelming majority vote of the stockholders of both companies.

"The Board of Directors of the merged company will consist of 19 members, 17 of whom are residents of the State of Virginia. A majority of the Board members are citizens of Virginia not otherwise connected with the company and whose primary purpose in serving is to contribute to the welfare of the area served. All of the officers of both companies will continue to serve as officers of the merged company.

More than 90% of the customers of the merged company are within an air line radius of 100 miles of headquarters located in Richmond. In our opinion the merger will result in a strong, sound, integrated company capable of providing the area served with the most reliable and adequate electric service at lower rates than would otherwise have been possible.

"For many years it was recognized that the combination of these two companies into a single operating unit would be beneficial to the public, consumers and employes, and the organizations of both companies are proud that this combination has been finally made on a basis which should prove beneficial to all concerned."

"Yah! You wrench jockeys! Who's gonna put magic in the public's life—gas or electric?"

New Pricing Method For Rebuilt Motors

A new method for pricing rebuilt fractional horsepower electric motors, such as those needed now to run refrigerators, washing and ironing machines, vacuum cleaners and similar household appliances, was announced June 21 by the Office of Price Administration.

Effective June 26, 1944, the new method will establish retail prices for rebuilt meters of ¾ horsepower or less at : (1) 75 per cent of the list price of the nearest equivalent new motor, (2) plus an additional sum of $7, (3) less the following allowance for the exchange; transfer or trade-in of a used motor—$1 for ¼ hp or less, $2 for over ¼ hp and including ½ hp, and $3 for over ½ hp and including ¾ hp.

Example: A buyer trades in a used ¼ hp motor on a rebuilt motor of the same size which lists at $12 when new. The maximum price for the rebuilt motor would be established by the following steps: (1) 75 per cent of the $12 is $9, (2) $9 plus $7 is $16, (3) $16 less $1 trade-in allowance is $15, which is the maximum price.

For sales of rebuilt fractional horsepower motors at levels other than at retail, the maximum price will be 85 per cent of the retail price determined by the new pricing method described above.

The rebuilt motors have been priced under provisions of the machinery regulation, which permitted a maximum price of 85 per cent of the new base price of an equivalent machine. Under that provision, very few of the many discarded motors on the shelves of dealers and in junk yards were rebuilt and offered for sale.

These fractional horsepower motors in normal times were built in large quantities and sold to appliance manufacturers in a highly competitive market—which resulted in low prices for the motors when new.

When one of the motors became defective or burned out, it was generally cheaper to discard it and replace it with a new one. Even for the manufacturer, with the machinery and facilities for manufacturing new motors, the added labor of stripping the old motors for rebuilding virtually equaled the cost of a new frame. For persons other than manufacturers, the cost for rebuilding was even greater.

Since former maximum prices gave no encouragement for rebuilding the discarded motors, and the War Production Board has in-

dicated that the present program for production of new motors of this type will fall far short of replacement requirements, this action was taken by OPA to assist in bringing out a supply of the rebuilt motors to meet critical civilian needs.

Serious complaints have been registered with the Office of Price Administration concerning the prices that repair shops are charging on a "labor materials" basis. The present action encourages rebuilders to create stocks of reconditioned machines and will be followed by another placing service charges under clear and specific control. These steps are expected to result in a reduction of the costs of motor replacement or repair to owners of electrical appliances.

A rebuilt motor, priced under provisions of this action, is one in which worn, defective, or missing parts have been replaced or repaired for successful operation and carries a binding guarantee of successful operation for not less than a year.

Georgia Power Expands Customer Service Program

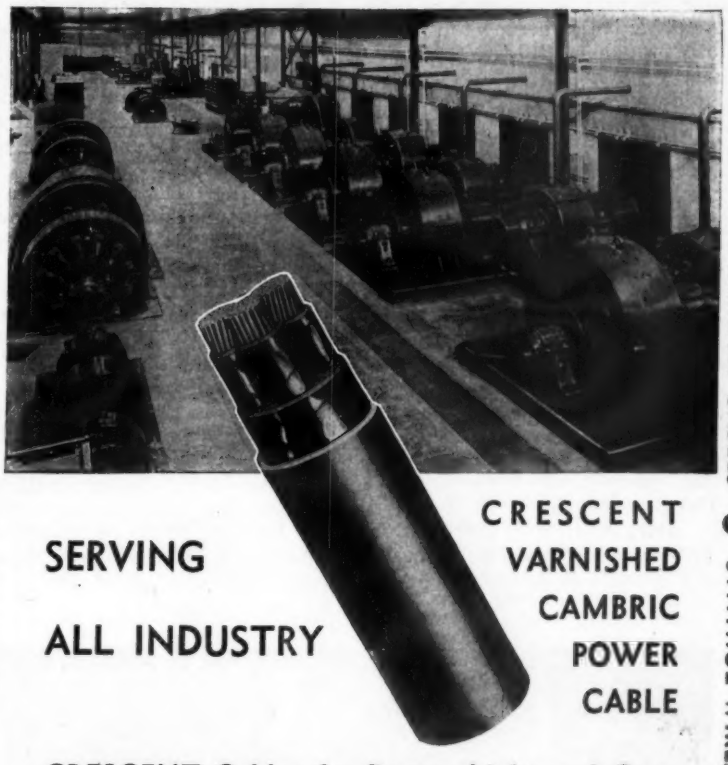
To provide additional services to the company's 231,000 residential customers, 40,000 commercial customers, 700 industrial and wholesale customers, and their communities, and to reinforce the work of existing personnel, the Sales Department of Georgia Power Company will add 33 new employees to work in its sub-divisions, as rapidly as they can be employed.

Plans for these additional customer services were explained to the division vice-presidents and sales supervisors, to heads of the divisions of the sales department, and to members of the advertising department, by C. A. Collier, vice-president in charge of sales, at a meeting in Atlanta.

"We want to do everything possible to help our customers make the best use of their existing equipment, and we want to help them shape up their plans for good business and good living after the war is won," Mr. Collier declared. He pointed out that current plans for expanding the sales department are just an "interim step upward" toward a comprehensive load-building program as soon as the war ends.

IMPERIAL NEOPRENE JACKETED PORTABLE CABLES ● PERMACORD ● LEAD-ENCASED AND PARKWAY CABLES ● SYNTHOL WIRES ● WELDING CABLES ● SHIPBOARD CABLES ● BUILDING WIRE ● SERVICE ENTRANCE CABLE ● CRESFLEX NON-METALLIC SHEATHED CABLE ● ARMORED CABLE

CRESCENT
INSULATED WIRE and CABLE



SERVING
ALL INDUSTRY

CRESCENT
VARNISHED
CAMBRIC
POWER
CABLE

CRESCENT Cables for Power, Light and Control have been installed in industrial plants for more than fifty years, with an enviable record for dependable service.

Meeting Excessive War Time Loads

CRESCENT
WIRE and CABLE

CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

SOUTHERN REPRESENTATIVES

ATLANTA, GA.
Edgar E. Dawes
312 Rhodes Bldg.

NEW ORLEANS, LA.
Paul Hogan, Jr.
823 Perdido St.

DALLAS, TEXAS
M. C. Huie Co.
707 Thomas Bldg.

RUBBER POWER CABLES ● VARNISHED CAMBRIC CABLES

Wiring Handbook Revision Undertaken by Committee

Consideration is being given to a revision of the various sections of the Handbook of Interior Wiring Design by the Industry Committee which has been reorganized and which is representative of all branches of the electrical industry. This move is taken in view of the experience gained over the past few years and with the objective of having the standards brought up to date for application in all types of postwar building construction and modernization.

E. A. Brand of the Buffalo Niagara and Eastern Power Corporation, Buffalo, N. Y., has accepted reappointment to the chairmanship. Working with him, representing the various branches of the industry, are F. N. M. Squires and Charles A. Ward, of the International Association of Electrical Inspectors; Richard Slauer and Leo Dolkart, representing the Illuminating Engineering Society; D. L. Ripley, representing American Lighting Equipment Association, Inc.; L. F. Adams, Frank Thornton Jr., H. G. Knoderer, H. E. Metz, William Seubert and H. H. Weber, representing the National Electrical Manufacturers Association; Allan Coggeshall and George H. McKee, representing the National Electrical Contractors Association, and D. M. Salsbury, representing the National Electrical Wholesalers Association. A. C. Bredahl is secretary of this committee and is also chairman of a technical committee which has been appointed to consider suggestions for revision, to be passed through to the main committee for action.

It is also contemplated that representatives of the architectural, building and financing interests, and of the national consumer, shelter and building publications, will be invited to offer suggestions.

Realizing that the most immediate need is consideration of revisions to the Residential Section, the committee is giving first attention to that part.

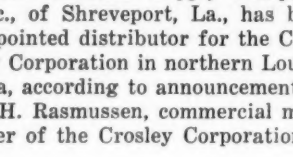
It is also planned to include a section on minimum wiring adequacy for farmsteads.

The committee will welcome suggestions from members of the industry for items which they feel should be taken into account in revising this industry handbook. Letters should be addressed to A. C. Bredahl, c/o Westinghouse Electric & Mfg. Co., 306 Fourth Avenue, Pittsburgh 30, Pa.

George MacGregor, president of the Dallas Power and Light Co., and Major General Donovan, of the Eighth Service Command, read the telegram notifying Betty Hudson, of Dallas, of her selection as a semi-finalist in the General Electric radio auditions. Miss Hudson appeared on the "Hour of Charm" radio program with Phil Spitalny and his all-girl orchestra. She was making her bid for the title of the "Undiscovered Voice of America" and a contract at $150 a week with Phil Spitalny's girls.

Crosley Distributor at Shreveport Appointed

The Electric Supply Company, Inc., of Shreveport, La., has been appointed distributor for the Crosley Corporation in northern Louisiana, according to announcement by J. H. Rasmussen, commercial manager of the Crosley Corporation.



A. S. Cahn

The Electric Supply Company was incorporated in 1937 after having been operated for several years as a partnership by Abry S. Cahn and Henry F. Cahn, co-owners of the Cahn Electric Company, a contracting and retail store in Shreveport which had operated continuously for the past 36 years.

Both Abry S. Cahn, president, and Henry E.Cahn, vice-president of the company, have had 36 years' experience in the electrical business. W. A. Wakeman, manager of the company, has had wide experience in electrical jobbing during the past ten years.

As soon as building conditions permit, The Electric Supply Company will occupy a new location at 1104-1110 Marshall Street. When remodeled, the new store will have a frontage of 120 feet in a location six blocks from downtown Shreveport and readily accessible to all parts of the city.

The company is setting up a complete service organization and as rapidly as parts are received from the factory, facilities for providing service for Crosley refrigerators will be available to dealers in the Ark-La-Tex area. In addition to the full line of Crosley products, The Electric Supply Company handles a complete line of electrical supplies including transformers, pole wire, hardware, etc.

Westinghouse to Make Radio Receivers Again

The Westinghouse Electric and Manufacturing Company, which discontinued the manufacture of home receiving sets in 1928, plans to re-enter this field as soon as war conditions permit, according to Walter Evans, vice president in charge of the Company's Radio Division, Baltimore, Maryland.

"We feel that for several reasons the postwar period offers an unusual opportunity to return to such production," he said. "With the obsolescence and wearing out of a large portion of the approximately fifty million sets in use at the start of the war, the requirements of the public will place demands on the industry far above the prewar volume. Westinghouse, to meet war demands, has enormously expanded its radio capacity. It is now turning out fifty-one times the radio equipment it produced in the prewar days.

"When peace comes again, instead of closing down these greatly expanded facilities, with resulting unemployment, we will turn them to the building of home radio receivers. Further, in the period since radios were last built, there have been great technical improvements growing out of the war work, to which the public is entitled in the post-war models.

"We will, therefore, manufacture standard receiving sets and frequency modulation, including phonograph combinations and, as soon as possible, home television equipment. These will be distributed to retailers through the Company's national distributing channels."

Mr. Evans recently announced the appointment of Harold B. Donley as manager of the Westinghouse Radio Receiver Division. Mr. Donley, who before his new appointment was general appliance manager for the Westinghouse Electric Supply Company, with headquarters in New York City, has been with Westinghouse for 22 years.

Civil Service Seeks Engineering Draftsmen

The Civil Service Commission has announced a continuing need for engineering draftsmen to work on the construction of maps, strategic posters and graphs, and technical plans in various Government agencies in Washington, D.

UNLIMITED
POSSIBILITIES
The T&B Sta-Kon Straight Pull Disconnect* Way of Wiring is opening up infinite new wiring possibilities for the electrical industry. Almost limitless combinations of unit and multiple assemblies can be made with the T&B Tips and Coupler because the Tips are identical and interchangeable. A few of the possibilities are shown here.
These new Approved Disconnect Devices are designed to connect, disconnect and reconnect at will all small wires #22–#10. And because they disconnect at a straight predetermined pull, they act as "mechanical circuit breakers"—disconnecting and breaking the circuit should the wiring be subjected to accidental external strain.
T&B Straight Pull Disconnect Devices are rounded and streamlined to the diameter of the cable to make insulating quick and easy.
They are part of the familiar T&B Sta-Kon Line of Pressure (solderless) Terminals. Easily installed with standard Sta-Kon pressure tools, manual or power.
We will fabricate and supply many arrangements of tips and couplers in any combination of wire sizes—#22–#10. We invite you to send us your specific design requirements.
All T&B products are sold exclusively through the service organizations of T&B Electrical Wholesalers.
For illustrated and technical Bulletin 522 on the Sta-Kon Disconnect Way of Wiring, contact your T&B Distributor through whom we distribute exclusively, or write your nearest T&B office.
The Thomas & Betts Co., Incorporated 518 Masonic Temple Bldg. New Orleans 12, La.
The Thomas & Betts Co., Incorporated P. O. Box 2372 Charlotte, North Carolina
The Thomas & Betts Co., Incorporated Room 423 Citizens & Southern Bldg. Atlanta 3, Ga.
*Pat. Pending. Sta-Kon Reg. U. S. Pat. Off.
T&B
THE THOMAS & BETTS CO.
INCORPORATED
manufacturers of electrical fittings since 1899
ELIZABETH, NEW JERSEY

C., and in other parts of the country. Women are particularly urged to apply. There are approximately 300 vacancies in Washington alone, existing largely in the Coast and Geodetic Survey of the Department of Commerce, in the Geological Survey of the Department of the Interior, and in various Bureaus in the War and Navy Departments. Positions for men only are open in Pearl Harbor.

Salaries range from $1,752 to $3,163 a year, including the amount for required overtime. Applications will be accepted in the Civil Service Commission until the needs of the service have been met. Each applicant must submit with his application a sample of his drawing and lettering. The proper form for applying may be secured at first and second-class post offices, from the Commission's regional offices, or direct from the central office of the Civil Service Commission in Washington 25, D. C.

Attendance Wins Star For Army-Navy E Flag

The Wiremold Company, Hartford, has been awarded the Army-Navy Production Award for the second time.

When the six-month period following the original award on July 10, 1943, had elapsed, it was found that the only deterrent to the company's being granted the privilege of flying the flag with a star was their attendance record. Working through the Labor-Management Committee, the employees were told why the star was not forthcoming on schedule. This resulted in a constant improvement until on May 27, the company was informed by the Under Secretary of War that the award had been made.

Nash-Kelvinator Wins Wartime Advertising Award

With "the job that has been done for the nation at war" as its chief criterion, the administrative board of the Annual Advertising Awards recently selected the 100 most outstanding ads of 1943. The Nash-Kelvinator ad, "I'm Not Playing for Marbles," which shared in the award, was twice read into the Congressional Record, according to C. J. Coward, who had charge of the advertising campaign.

This outstanding Nash-Kelvinator ad told of the hopes of "G. I. Joe" for the tangible kind of world for which he risks his life. It impressed leaders of the House and everyday citizens alike as having done a vital job for the nation at war, according to criteria adopted by Elmer Davis as the job all good war advertising should be doing.

Coward reported in connection with the award that the company's wartime advertising program, in his opinion, was currently leading the appliance field in readership. To date the company has drawn requests for more than 250,000 reprints of the various "inspirational" ads included in the Nash-Kelvinator series. Thousands of letters in Nash-Kelvinator files disclose the series has continued to win the hearts of millions of Americans—including servicemen.

Southern Section, Inspectors' Association To Hold 16th Annual Conference in Atlanta

The Ansley Hotel, in Atlanta, has been selected as headquarters for the Sixteenth Annual Conference of the Southern Section, International Association of Electrical Inspectors, to be held on Monday, Tuesday and Wednesday, September 25 to 27.

More than usual interest in the conference has been indicated since the recent announcement that a 1945 revision of the National Electrical Code would be issued in the fall of 1945. Since this meeting will be the last at which recommendations for Code revisions can be introduced for the 1945 edition, it is expected that this fact will bring about considerable lively discussion during the sessions set aside for reports of Article Committees and general Code discussion.

The opening session on Monday, September 25, will include addresses by International President James D. Lynett, of New York City, and Southern Section President Dewey L. Johnson, of Atlanta, as well as reports of the Executive Committee, headed by George Welman, chairman, the secretary-treasurer, A. M. Miller, and the representatives on the Electrical Committee, N. E. Cannady, of Raleigh, and J. G. Fisher, of Jackson, Miss.

The Monday afternoon session will hear reports from the Postwar Committee, George Welman, chairman, the Papers Committee, F. G. Camus, chairman, and the Committee on Fuse Tampering, C. V. Reynolds, chairman. "Tips for Electrical Inspectors," will be the subject of a talk by E. C. Knox, first vice president of the section. Every session after the Monday morning session will include an hour or two for reports of Article Committees, general Code discussion, or Code panel discussion.

Speakers at the Tuesday morning session will include M. M. Brandon, of the Underwriters Laboratories, Inc., New York City, who will talk on "Substitute Materials and Methods," and L. F. Adams, of General Electric Co., Schenectady, whose subject will be "Proposed Code Requirements for Interior Network Distribution Systems."

Among the subjects of addresses to be heard at the Tuesday afternoon session are "Postwar Education and Adjustments of Electrical Workers," "Code Treatment of Infra Red Drying equipment," and "Interim Amendments and Interpretations."

The annual dinner meeting will be held Tuesday evening this year in order to permit those in attendance to leave early Wednesday evening if they wish.

E. C. Knox will open the Wednesday morning session with a report from the Postwar Committee on Inadequate Installations. New officers will be elected at the concluding session.

Electrical Retailers' Association Formed

The National Electrical Retailers' Association held an organization meeting in Chicago, recently, and elected Chester B. Sikking, of Springfield, Illinois, as the Association's first president, and J. A. Cobbey, Chicago, attorney for the Association, as acting secretary. The Association has selected the Merchandise Mart for their headquarters and will open their office there on July 1st.

Other officers will be elected as soon as possible and the Directors will be nominated and elected by the members of the Association.

ADVANCE INFORMATION

About New

HOLDENLINE FLUORESCENT

We are now engaged in the actual production of dies, tools and jigs for the manufacture of HOLDENline's exciting *new industrial* fixtures . . . in addition to carrying on a steady manufacturing schedule.

Due in a few weeks, providing that everything moves according to plan, the new HOLDENline *Industrial* is visioned not as a postwar development, but as an *immediate* contribution to industrial needs. Something you will soon be able to sell or use.

When you look at the lines of the new fixtures, we frankly admit that outwardly there will be no super challenge to the eye. Good lines, excellent finish, high efficiency, of course.

But as you dig into the "innards" of this new HOLDENline, you may get a little excited. Characteristic HOLDENline thoughtfulness of the customer's needs marks the development of each detail. A lot of boys in the fixture business are going to wonder why they didn't think of these *plus* features first. We mention a few:

New lamp sockets that eliminate all breakage in shipping and handling.

Battleship construction plus. We use the "Butt-on" socket. Quite frankly a more expensive wiring set-up, and we mount *on a heavy steel plate* that firmly supports the sockets to the channel. This extra value costs buyer nothing extra.

Another advantage. Butt-on sockets *position* the lamps further away from the reflector, increasing their overall efficiency.

Deeper channel, so that *switches* can be inserted more easily. More rigid cross section, effected by interesting changes in contour. Yet, to the casual observer, similar in appearance to our present channel.

Steel or ligniform reflector as demanded. The *steel* reflector, designed in our own Photometric Laboratories by HOLDENline engineers, will have an overall output well up in the eighties.

NEW COMMERCIAL FIXTURES

Strengthening our line in its attractive completeness will be the new commercial fixtures for some time under development. *Original,* soundly engineered, with lighting features *that will steal sales,* you will greet this new member of the HOLDENline family with deep seated pride and enthusiasm.

Write for illustrated Bulletin that tells all about these important new fixtures. Get your name on our list for earliest information.

BUILT TO HOLDENLINE STANDARDS BY HOLDENLINE

Engineered by HOLDENline and produced in HOLDENline's own shops under the tough, critical supervision of HOLDENline engineers and experts, you will quickly see why HOLDENline Fluorescent fixtures, since the pioneering days of 1938, have been noted for efficiency and freedom from service costs.

Sold only through wholesalers

THE HOLDENLINE COMPANY

Pioneers in Fluorescent

1960 EAST 57TH STREET • CLEVELAND 3, OHIO

PERSONAL NOTES
About Men You Know

B. H. McCoin will be stationed at the Atlanta Office of the Allis-Chalmers Mfg. Company as a field engineer, the company has announced. Mr. McCoin, who has been with Allis-Chalmers since April, 1944, has had many years of experience with electric power companies in Tennessee. After

B. H. McCoin

serving from 1924 to 1938 in the test departments of the Tennessee Electric Power and Tennessee Public Service companies successively, he was placed in direct charge of operations as superintendent of the bureau of power on the Knoxville Electric Power and Water Board.

In his new capacity, Mr. McCoin will represent Allis-Chalmers in the territory which includes Georgia and parts of Tennessee and North and South Carolina.

* * *

B. W. Clark, vice president of the Westinghouse Electric and Manufacturing Company, has announced the appointment of **John M. McKibben** as assistant to the vice president. Formerly manager of the Company's Application Data & Training Department, Mr. McKibben's new responsibility will include all product and industry advertising, in addition to his present duties.

A native of Pittsburgh, Mr. McKibben joined Westinghouse in 1922 as a member of the promotion division in Pittsburgh. Two years later he was made advertising manager of the Company's Cleveland office, remaining there until 1927 when he was appointed advertising manager of the Detroit office. Later his offices were moved to East Pittsburgh where he supervised promotional operations involving all industries served by Westinghouse equipment.

J. M. McKibbin, Jr.

In 1936 he was named apparatus promotion manager to coordinate all such activities, except those involving Westinghouse merchandising equipment, at headquarters and in district offices. He remained in this position until 1937 when he was appointed head of the Application Data & Training Department.

Last year Mr. McKibben received the Company's highest honor—the Order of Merit—for the "imaginative way he has dramatized the obligation of Westinghouse people to increase production of war materials."

* * *

Announcement was made recently of the appointment of **James Steel Mahan,** of Chicago, Illinois, as special consultant for the Ceramics Specialties Co., Illinois Electric Porcelain Co., Porcelain Products, Inc., Specialty Works, Superior Porcelain Co., and Universal Clay Products Co.

Mr. Mahan will serve these organizations (in addition to his other clients) in an advisory and consulting capacity in connection with technical matters and engineering problems involving the broader use of porcelain insulated wiring. He will handle all technical matters pertaining to the interpretation of existing codes and statutes.

* * *

H. V. Erben, manager of the central station divisions of the General Electric Company since 1941, has been elected a commercial vice-president.

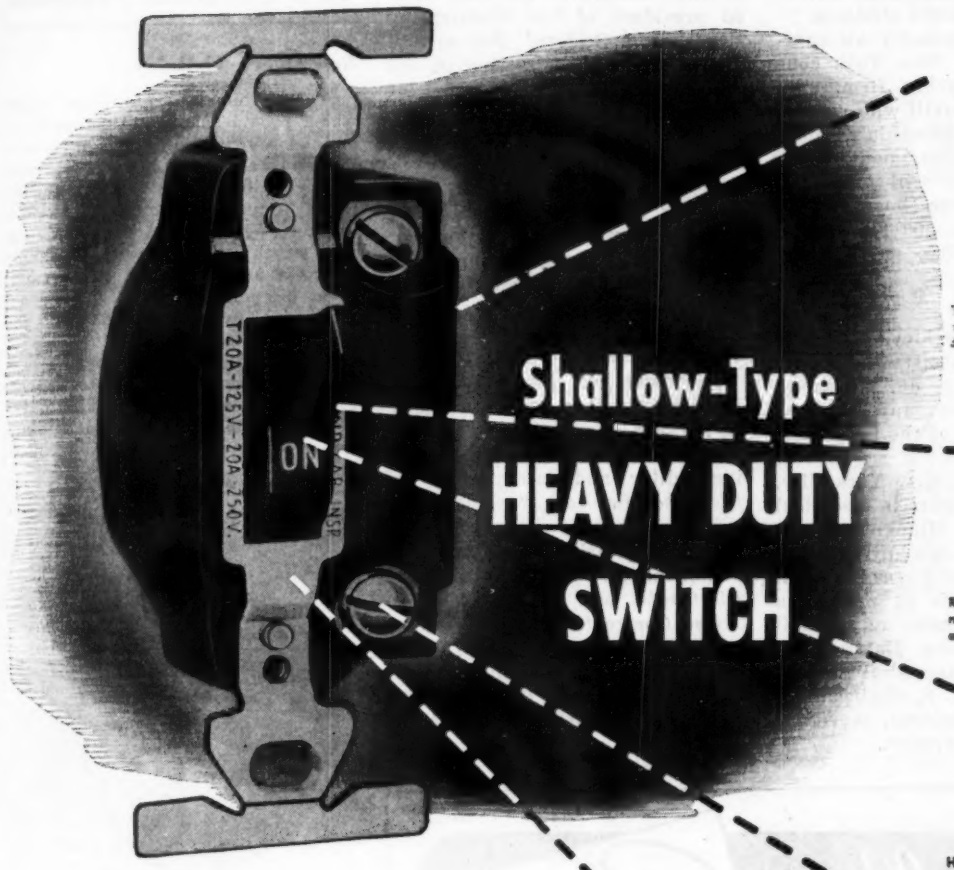
A native of Schenectady, Mr. Erben is a graduate of Yale's Sheffield Scientific School, as a mechanical engineer. He became

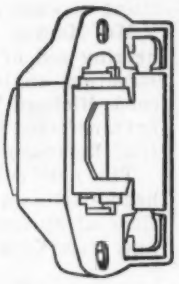
H. V. Erben

associated with General Electric in 1917, but left in September of that year to enter the U. S. armed services as a second lieutenant in field artillery. Re-entering the company's employ in 1920, he was in the testing department until 1922, when he was transferred to the lighting engineering department, fore-runner of the present central station divisions. In 1923 he was named section head of the apparatus division, and on October 1, 1928, became assistant to the manager of that division, a year later becoming manager. In 1933 he was promoted to manager of switchgear sales with headquarters in Philadelphia, where he remained until 1939, when named assistant manager of the central station divisions, a position he held until 1941, when he became manager.

* * *

Richard G. Mackey, of Bronxville, N. Y., has been added to the advertising staff of the Radio Division of Sylvania Electric Products Inc., as editor of Sylvania





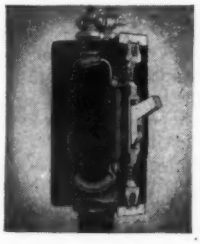
BAKELITE CASING fully encloses mechanism. Extra thick walls survive handling impacts and exclude dust and dirt.

RUGGED MECHANISM of heavy-gauge metals withstands repeated use and abuse, assures trouble-free operation.

HEAVY SPRING of carefully tested spring wire assures positive switch action for tens of thousands of cycles.

POSITIVE CONTACT provided by doubled-sided blades of selected spring bronze, shaped and adjusted to "make" and "break" contacts simultaneously.

STURDY YOKE has integral plaster ears for aligning flush with wall, or easily broken off if not needed. Completely insulated from mechanism.



SHALLOW DESIGN *permits installation in 1½ inch deep box, with adequate space for easy wiring*

The Bryant 5861 switch is "T" rated at 20 amperes, built to carry the heaviest demands of the rated load. Every part in the switch is made of the strongest materials available, assuring you of a shallow-type switch capable of withstanding tough service. Note the details of Bryant construction and design as shown here.

Specify Bryant Devices from your Electrical Wholesaler

BRYANT
SUPERIOR WIRING DEVICES

THE BRYANT ELECTRIC COMPANY
BRIDGEPORT, CONNECTICUT

NEW YORK
CHICAGO
SAN FRANCISCO
LOS ANGELES

News, it was announced recently by **Terry P. Cunningham,** advertising manager, Radio Division.

Mr. Mackey, formerly an engineering aid of a New York construction engineering firm, succeeds **Richard Merrill** who recently transferred to Sylvania's Industrial Relations Department.

The new editor will make his headquarters at the New York offices of Sylvania, 500 Fifth Avenue, New York City.

* * *

A. Dexter Hinckley, formerly administrative assistant to the Dean of Engineering, Columbia University, has been appointed executive secretary of the Illuminating Engineering Society, at 51 Madison Ave., New York City.

A prominent figure in electrical engineering, Mr. Hinckley brings to his new position many years of administrative and professional experience. He is at present a Director and Member of Council of the Illuminating Engineering Society, and has served as general secretary of I. E. S, chairman of the New York Section, secretary of the New York Section.

Samuel Baker Williams, editor of *Electrical World,* has been elected president of the Illuminating Engineering Society. For several years he has been active in the Society, serving as chairman of its Advisory Planning Committee since that committee was created in 1940, and as senior vice-president of the organization. Mr. Williams is chairman of the Lamme Medal Committee and a member of the Post-War Planning Committee of the American Institute of Electrical Engineers.

Mr. Williams became associated with *Electrical World* in 1914 after graduating from Princeton University with a graduate degree in electrical engineering. He resigned in 1922 to become managing editor and later editor of *Electrical Record.* Two years later he left that paper to take charge of the *Electragist* as editor and manager. In 1928, when the *Electragist* was changed to *Electrical Contracting,* Mr. Williams remained as editor, until his transfer to the managing editorship of *Electrical World,* in 1936. In 1938, he became editor of *Electrical World.*

What's New in **STAGE SWITCHBOARDS**

WRITE FOR YOUR COPY OF THIS NEW, INFORMATIVE BOOKLET

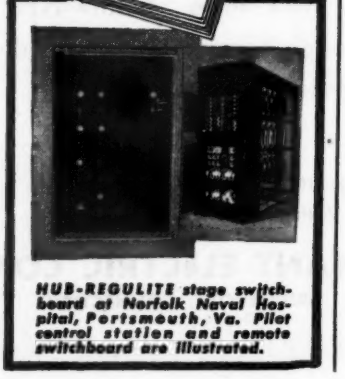
CUSTOM BUILT SWITCHBOARDS

STAGE and GENERAL LIGHTING EQUIPMENT

Today our shops are almost entirely occupied with war projects such as Marine Switchboards, Stage Switchboards and Lighting Equipment for Army, Navy and Air Corps installations. But where priorities permit and materials are available, we can still fill orders for industrial and other applications.

If we or our Resident Engineer nearest you can be of assistance, please call on us. And let us send you our new booklet which describes the latest developments in Stage Switchboard design.

HUB ELECTRIC CORPORATION
2229 West Grand Avenue • Chicago 12, Ill.

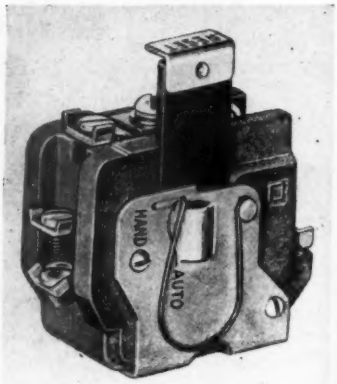


***HUB-REGULITE** stage switchboard at Norfolk Naval Hospital, Portsmouth, Va. Pilot control station and remote switchboard are illustrated.*

New Electrical Products

New Overload Relay

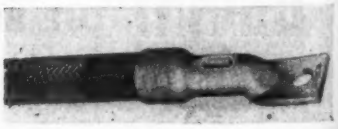
A new bimetallic overload relay which provides an easy yet positive method of changing from automatic to hand reset, has been announced by the Industrial Controller Division of the Square D Company, in Milwaukee, Wisconsin. An unusual feature of this new relay is a simple means of adjusting the tripping point from 85 per cent to 115 per cent of nominal rating. Thus, changes can be made in settings to take care of variations in ambient temperature or load conditions at the motor. Overload protection is not limited to the usual selection of heater sizes since intermediate points can be obtained.



These new Type AR relays designed for separate mounting or front mounting on Size O and I starters, are needed whenever starters are mounted in remote or inaccessible locations. They are particularly well suited for use in built-in machine tool control because they eliminate the need for external reset mechanisms. A bulletin (No. 201) which carries complete details may be obtained by writing the Industrial Controller Division, Square D Co., 4041 N. Richards St., Milwaukee 12, Wisconsin.

Water-Seal Connectors

The Burndy Hysealug is designed to provide a water seal for cable ends. Hysealugs are made from pure copper and silverplated. The barrel of the Hysealug is indented onto the conductor while the shroud is com-



Sure, it's out-of-date

—but no more so than outworn distribution methods

This little number was quite a sensation during the last war—but it's seen its day, like certain equally old-fashioned distribution methods. For too many years electrical appliance dealers have been deprived of profitable vacuum cleaner business through "in-the-home" selling—either direct retail selling by a manufacturer or some so-called "resale" arrangement.

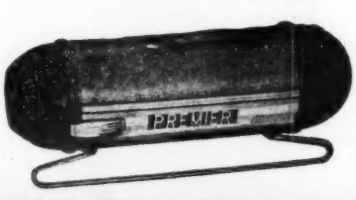
Premier's up-to-the-minute distribution system can—*and will*—put you, the dealer, in the most favorable competitive position to get your full and logical share of vacuum cleaner sales. Premier cleaners will be *distributed* only through independent specialty appliance distributors selected for their convenient geographical location and their ability to render maximum service! Premier cleaners will be *sold* only by franchised electrical appliance dealers!

This economical set-up offers you decisive competitive advantages. You'll have none of the exorbitant costs of "in-the-home" selling to add to the purchase price of the cleaners you sell—such as salesmen's commissions ranging from $10 to $25 depending on make and model; the additional expenses of crew leaders, supervisors, training courses, etc.; or the heavy cost of retail crews assigned to the larger retail outlets for so-called "resale" operations.

With Premier you'll be in the ideal spot—able to offer customers *top-quality merchandise* that can be sold at *lower prices* because of *distribution economies!*

GUARANTEED CERTIFIED SERVICE For Vacuum Cleaners

ARMY E NAVY



PREMIER

DIVISION

ELECTRIC VACUUM CLEANER COMPANY, INC.

CLEVELAND 10, OHIO

FLAMENOL* BUILDING WIRE (Small Diameter)
MEETS ALL REQUIREMENTS

Type SNW
For Wet Locations

Type SN
For Dry Locations

Now you can wire buildings completely with thermo-plastic insulated Flamenol Small Diameter Building Wire. Use Type SN for dry locations and the new Type SNW for wet locations.

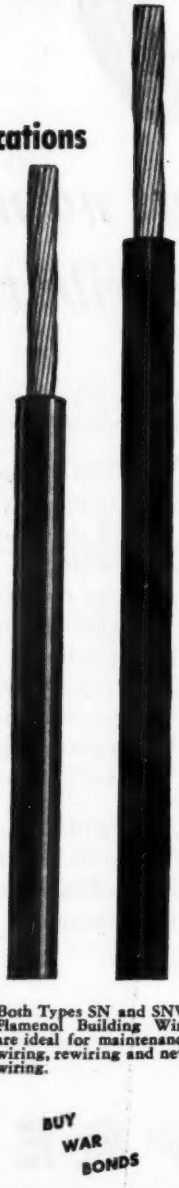
The insulation of both these wires has long life, is high in dielectric and mechanical strength and is resistant to oils, acids and alkalies. In addition, Type SNW Flamenol Wire insulation has low moisture absorption. This wire is approved by the Underwriters' in sizes 14 to 4/0 inclusive for use in raceways in wet locations as follows;

1. *Underground*
2. *In concrete slabs or masonry in direct contact with the earth*
3. *In wet locations*
4. *Where the condensation and accumulation of moisture within the raceway is likely to occur.*

Both Types SNW and SN Flamenol Building Wires are small in diameter and easy to install. For further information see the nearest distributor or mail the coupon for descriptive folders.

Hear the General Electric radio programs: "The G-E All Girl Orchestra" Sunday 10 P.M. EWT, NBC. "The World Today" news, every weekday 6:45 P.M. EWT, CBS.

*Reg. U.S. Pat. Off.



Both Types SN and SNW Flamenol Building Wire are ideal for maintenance wiring, rewiring and new wiring.

BUY WAR BONDS

General Electric Company
Section W-741-16
Appliance and Merchandise Dept.
Bridgeport, Connecticut

Sirs: Please send me the folders on Type SNW and Type SN Flamenol Small Diameter Building Wire.

Name.....

Address.....

City.....State.....

GENERAL ELECTRIC

pressed over insulation to form a water-tight cable-end seal. Installation is made with a Burndy Hypress and a dual die which indents the connector and compresses the shroud in one operation for cables up to 1000 MCM. Hysealugs above 1000 MCM are installed with separate dies for indentation and compression.

Illustration shows water-seal terminal (Hysealug) for single conductor cable. Other sizes and types (Hysealinks, Hysealplugs, etc.) are available for cables from No. 4 to 2000 MCM. For further details write Burndy Engineering Co., Inc., 107 Bruckner Blvd., New York 54, New York.

New G-E Formex Wire

Formex* ribbon-rectangular magnet wire available in shapes as thin as 0.004 inch, has been announced by the General Electric Company. The new Formex, being made for the war program is one-fourth the size heretofore considered the low limit for thickness of this wire.

Smooth, strong, flexible, and able to withstand high-speed winding without damage to insulation, the new Formex ribbon-rectangular wire offers many application possibilities to producers of electronic devices and other electric components. (*Reg. U. S. Pat. Off.)

Woodworking Calculator

An exclusive new "Handy Calculator" is now available to all workers with wood through a special wartime offer by the makers of the famous Greenlee line of registered tools for the craftsman.

Designed to help the home craftsman solve the many puzzling problems which so often crop up unexpectedly on a job, this calculator is packed full of valuable data. The operation is simple: by merely adjusting the dial you can convert linear to board feet, determine slope per foot in degrees, find comparative hardness, weights, shrinkage, warping and ease of working of various woods.

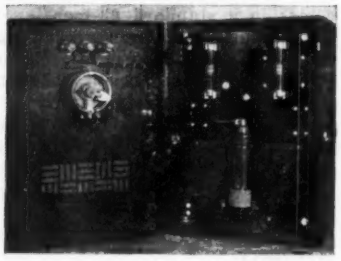
Bit sizes for head, body and thread

of standard screws, nail specifications, tips on tool sharpening are also included on this calculator, which is an accurate protractor as well.

Constructed of heavy varnished cardboard, soil-proof, this tool is 6 inches in diameter and should fit any tool kit quite easily. As long as the supply lasts, a Handy Calculator may be obtained for 10 cents by writing direct to Greenlee Tool Co., Rockford, Illinois.

New Spot Welding Timer

Suitable for welding small objects of high conductivity such as aluminum or copper, a new precise welding timer with heat control for timing intervals of one-half cycle or less is announced by Westinghouse Electric and Manufacturing Company.



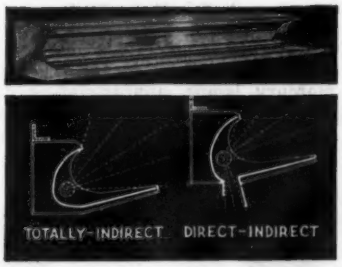
Precise, because the welding current is made to start at the same point on the voltage wave for every operation, the new SP-18, ½ cycle timer is designed for welding of such items as radio tube parts and sockets, pig-tail resistors to terminal lugs, watch and instrument parts, contact tips on electrical relays and other small parts.

The timer is furnished as a separate control with existing small bench welders and also in combination with a small welding transformer. Only one control tube is used, this thyratron serving the dual purpose of rectifying alternating current to charge a firing capacitor and also firing the small ignitron power tube. Heat control is accomplished by a phase shift method, the adjustment dial for which is mounted on the cabinet door.

Further information on this timer, rated at 230/460 volts, 50/60 cycles, may be secured from Department 7-N-20, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

Germicidal Fixture

A new development now brings the germ-killing powers of sunlight indoors. The application of this new development to industrial plants and offices is a practical one, and is based on much research and many



tests. The new aid is a combination of the G-E Uviarc Lamp and a special reflector-unit which irradiates ultra-violet rays safely and effectively. The illustration shows the combination which is available in two types, two sizes for each type.

The positive germ-killing action of this development is derived by emission of 2537A rays which destroy bacteria and viruses that float on the air-currents. Convected air currents carry germs into the path of ultra-violet rays to insure the most efficient known method for disinfection of the air.

Model Nos. M-2910 & 12 use the 15-watt G-E Uviarc, and Models Nos. M-2911 & 13 use the 30-watt tube. The fixtures are manufactured by The Edwin F. Guth Company, 2635 Washington Ave., St. Louis 3, Mo.

BullDog Bulletins

Two new bulletins have just been announced by the BullDog Electric Products Co., of 7610 Jos Campau Avenue, Detroit, Michigan. Copies are available upon request.

Condensed Catalog No. 441 giving basic information, list prices, dimensions, etc., on Safety Switches, Light and Power Panelboards, Switchboards, Circuit Breaker Panelboards, Kbl-Duct and BUStribution Duct.

Bulletin No. 427-1 illustrating and describing BullDog BUStribution Duct of the Ventilated Low Reactance Type for Feeder Circuits up to 2000 Amperes.

New Electronic Relay

A new electronic relay for amplifying the very limited current transmitted by delicate control contacts or high resistance circuits, thus materially increasing the application range of many control devices, has been announced by the Industrial Control Division of the General Electric Company. Operated by any material having a resistance of from 0 to 500,000 ohms, or even greater if necessary, the new relay is especially suitable for controlling liquid levels in tanks and boilers, sorting metallic parts by size, detecting broken threads in textile machines, and as a limit switch requiring extremely light pressure to operate.

Small and light in weight, thus facilitating easy installation, the new relay consists of a standard type electronic tube, a supply transformer, and an electro-magnetic relay—all mounted in a totally enclosed, weather-resistant enclosure suitable for wall or machine mounting.

In operation, the electro-magnetic relay in the device is kept energized as long as the controls connected to the input grid circuit of the electronic tube remain open. The instant these contacts close, the relay is de-

energized. A built-in time delay feature prevents chattering when the contacts in the input circuit are momentarily closed. A contact arrangement on the electro-magnetic relay permits the device to be used either to make or break a load circuit when the actuating contacts connected to the input circuit on the electronic relay are closed.

New Megohmer Bulletin

The Herman H. Sticht Co., Inc., of 27 Park Place, New York 7, N. Y., has issued a new bulletin No. 435 describing the model B-5 Megohmer, battery-vibrator type insulation tester. The new bulletin shows the triple color scale, the various models available, and contains a chapter on the value of periodic insulation resistance measurements as recorded on Megographs. Copies of the bulletin are available upon request.

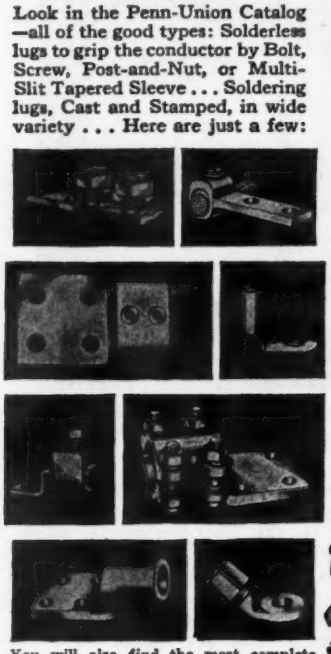
Cable Terminators

A new publication No. 4405 just issued by the Delta-Star Electric Company, 2400 Block Fulton Street, Chicago 12, Illinois, describes sealed type single and three conductor equipment cable terminators. Construction details, dimensions and electrical characteristics are given. Copies are available upon request.

"To get the **RIGHT** lug at every point—

—select your terminals from the **COMPLETE** line"

Look in the Penn-Union Catalog —all of the good types: Solderless lugs to grip the conductor by Bolt, Screw, Post-and-Nut, or Multi-Slit Tapered Sleeve . . . Soldering lugs, Cast and Stamped, in wide variety . . . Here are just a few:



You will also find the most complete line of Cable Taps, Tee Connectors . . . Straight, Parallel, Elbow and Cross Connectors . . . Bus Supports, Clamps, Spacers . . . Grounding Clamps, Service Connectors.

Penn-Union fittings are preferred because every one is mechanically and electrically *dependable.* They are the first choice of leading utilities, industrials, electrical manufacturers, contractors. *Write for the Penn-Union Catalog.*

L. MORRIS LANDERS
309 WALTON BUILDING
ATLANTA, GA.

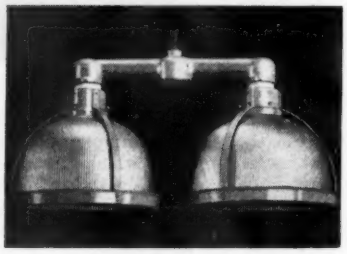
WALTER J. HUEMMER
DALLAS TRANSFER & TERMINAL WAREHOUSE BLDG.
DALLAS, TEXAS

PENN-UNION ELECTRIC CORPORATION, ERIE, PA.

PENN-UNION
Conductor Fittings

Pittsburgh Dualight Unit

Designed to provide a perfect blend of light from incandescent and mercury lamps, approximating daylight in quality, new Dualight units are available for general or localized lighting of industrial plants.

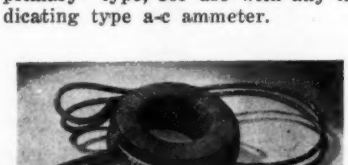


Dualights will supply over twice as much light without increasing the number of outlets; are quickly, easily installed. Each twin-hanger unit is tapped for ¾" conduit stem; is equipped with removable plate to simplify wiring; Mogul sockets, safety holders, appropriate Permaflectors and reflector retaining rings.

Permaflectors, "shaped mirrors" of silvered glass, provide engineered light control for broad, medium, or concentrated light distribution from low or high bay mounting. 500-watt PS-40, and 750 or 1,000-watt PS-52 incandescent lamp, in conjunction with a 400-watt T-16 mercury lamp, with appropriate Permaflector, provide desired light distribution and intensity. Dualight units are made by the Pittsburgh Reflector Company, Oliver Building, Pittsburgh, Pa.

E-M Current Transformers

E-M DoNut Current Transformers, manufactured by the Electric Machinery Mfg. Co., of Minneapolis 13, Minnesota, are easily-installed, accurate transformers of the "inserted-primary" type, for use with any indicating type a-c ammeter.



The DoNut is slipped over the bus or conductor to be measured, taped or lashed in place if for permanent installation, and the leads connected to the ammeter.

DoNut transformers are built standard in 200-5, 300-5, 400-5, and 500-5 ampere ratios; special ratios can be furnished. Ratio accuracy is 1 per cent for ranges above 300 amperes and 2 per cent for ranges 300 amperes and below on frequencies of 25 to 133 cycles, and from 15 to 150 per cent load. Rated burden is 2 volt-amperes.

Lower ratios than those listed above can be obtained by passing the primary conductor through the transformer two or more times. For example, two turns through a 300-5 ratio transformer would give a 150-5 ratio; 3 turns, a 100-5 ratio. Special ratio transformers can also be supplied.

Core of the transformer is liberal in size. It is built up of low-loss steel laminations, tightly taped.

New Colovolt Booklet

The new Colovolt Cold Cathode Low Voltage Lamp, manufactured by the General Luminescent Corporation, 638 S. Federal St., Chicago 5, Illinois, is a fluorescent lamp which comes in a standard 93-inch length, and 25 mm. diameter. Complete data and 40 salient features of this new cold cathode fluorescent lamp are clearly and concisely stated in a booklet "Facts About Colovolt Cold Cathode Lighting" which has just been released by the above concern. A copy may be obtained by writing to R. L. Sullivan, General Luminescent Corporation, on your business stationery.

Among the facts in the booklet are those covering such subjects as: low voltage requirements; instantaneous starting (no starters needed); starting and operation in low ambient temperatures; 8,000 hour lamp-life expectancy—operating guarantee of one year; and low surface brightness, with resultant minimum glare.

Quick-Start Ballast

The new Quick-Start fluorescent ballast announced by The Acme Electric & Mfg. Co., of Cuba, N. Y., for use with "Instant Start" fluorescent lamps, eliminates the need for starters and provides for instantaneous lamp light. Now available in dual 40-watt size for two 40-watt lamps, in either end-lead or bottom-lead designs. Operating from standard 115/120 primary circuit, it boosts the voltage to approximately 450 volts for lamp starting.

It is claimed that when used in connection with the new "Instant Start" fluorescent lamps—no sacrifice is made in the accustomed operating advantages or lamp life. However, if used for other than "Instant Start" type lamps, lamp life is variably reduced. Old type fixtures may be changed to "Quick Start" by replacing old type ballasts with this new Acme Quick-Start design, and installing the new "Instant Start" type fluorescent lamps.

Electronics at Work In Industry

(*Continued from page* 40)

color of the light. The photo-tube does not have any intelligence, and therefore cannot duplicate the performance of the human eye for the great majority of sorting problems. The only way in which a photo-tube can be made to appear to have judgment or intelligence is to so design the optical system that the photo-tube will receive a varying amount of light depending upon a particular characteristic of the material which it is desired to detect.

The application of photo-tubes to sorting problems is usually very expensive because of the considerable development involved and many times cannot be justified for that reason alone. This development expense can be absorbed if the commercial possibilities for the finished design are sufficiently enticing, but if they are not, the individual user is not ordinarily willing to pay the development charges.

Many applications for photo-electric control can be taken care of by general purpose devices called photo-electric relays which may be considered as light sensitive limit switches. These are available in varying forms and at varying prices, depending upon the desired sensitivity.

The applications described show a variety of typical applications for electronic control. These have come about through close coordination of the electrical and mechanical design. Only by this co-operation has it been possible to insure that the electrical and mechanical equipment will match each other in precision and reliability. If they do not match, a regulator with 1/64″ accuracy may be attempting vainly to control a machine with 1/8″ backlash or a precision machine may lose its value because of coarse control.

Electronic control, properly selected for applications where it can perform better or less expensively, will do what seems to be miracles. This is so because new tools with incredible speed and versatility have been added to the designers kit. His vision is thus broadened beyond the pure mechanical or the electro-mechanical device to the electronic tube which is purely electrical with incredible speed and versatility. Through proper combination of all

AT 150°C

THE G-E INSULATING VARNISH WAS UNCRACKED

Rigid tests of each new varnish developed by General Electric is a prime prerequisite to placing it on the market. And, naturally, these tests are made under conditions duplicating, in a more exacting degree, those which the varnish is compounded to meet. Typical was the test of two varnishes, each intended for insulating electrical apparatus where high temperatures would be encountered. The G-E varnish withstood the accelerated heat-aging test; the other broke down.

THERE IS A G-E INSULATING VARNISH FOR EVERY NEED

★

Hear the General Electric radio programs: "The G-E All Girl Orchestra" Sunday 10 p.m., EWT, NBC. "The World Today" news every weekday 6:45 p.m., EWT, CBS.

BUY WAR BONDS

If you face a problem in finding the correct insulating varnish for your specific needs, the engineering staff of the Resin and Insulation Materials Division of the General Electric Company will gladly co-operate with you. Consult your local G-E Distributor or write to: Section M744-16, General Electric Company, Schenectady 5, New York. (Varnishes are one product in the complete line of G-E insulation materials.)

GENERAL ELECTRIC

"Mr. Tops," The Paragon Symbol of Top Quality.

LET "MR. TOPS" CONTROL YOUR TIMING of

***Automatic* HEATING, VENTILATING, LIGHTING, PUMPING OR FLUSHING OPERATIONS . . .**

Paragon 700 Series Time Switches are equipped with 6" calendar dials which make one complete revolution every 7 days. Dial trippers can be independently set for different daily ON and OFF schedules. Settings can be made in advance for an entire week. Any day or days operations may be omitted entirely on a pre-set program.

Each day of week clearly separated from other days; graduated into hours and half hours; day and night distinctly separated. Operations from ON to OFF or from OFF to ON can be set as close as three hours apart and can be separately adjusted throughout each 24 hour day in the week.

Write for a complete bulletin.

Paragon 700 Series Time Switch

PARAGON ELECTRIC COMPANY
713 Old Colony Building
Chicago 5, Illinois

Paragon *Chicago*
BUILDERS OF ELECTRICAL EQUIPMENT . . . SINCE 1905

three of these tools, designers are unfolding new engineering accomplishments with amazing possibilities.

Training Skilled Motor Repairmen

(Continued from page 15)

quirements is its tooling.

Included in the company's equipment inventory are a test panel for checking all types of coil-windings; a test bench for checking single and 3-phase a-c and d-c motors; a single and 3-phase winding machine to form coils for units up to 50 hp; armature stands of several types; and armature balancing apparatus.

To handle automotive electrical repairs, the shop is equipped with testing devices for checking generators, starting motors, voltage regulators and distributors. For magneto work the firm has testing apparatus and magnet rechargers.

"Labor savers" include wire-stripping machines for removing insulation from armature and stator wiring, a slot-insulation shaping device, and a mechanical coil taper.

Among the shop's general-use equipment items are a 20-ton hydraulic press and a lathe having a 9-in. swing and a 6 ft. bed. Dipping tanks and an electric baking oven will accommodate armatures from motors up to 50 hp. Contained in a separate room is the shop's cleaning and finishing setup, consisting of cleaning vat, electric buffer, sand blaster, paint sprayers and a 140-lb. air compressor.

Personnel training and the use of error-eliminating and labor-saving devices have an important place in Electrical Equipment's postwar planning program. When the country again has returned to a normal way of life, the company anticipates bigger and better uses in South Florida for electrical powering apparatus. Therefore, in order to handle efficiently a presumably larger service volume, the firm intends to increase both its equipment and its operating staff.

In connection with the latter part of its planning, Electrical Equipment has in mind the training of demobilized service men. A sizable percentage of the Armed Forces personnel either have worked in one or another of the electrical trades or have received some sort of electrical instruction while in service. Obviously, such men have excellent background training for motor repair-shop work. However, as Kemp sees it, they will need special training, not only to do power-unit reconditioning, but also to do the work as the company wants it done. Moreover, in many cases, the psychology of ex-servicemen may have to be adjusted to the viewpoint necessary for serving civilian customers.

Know Your Customers, Dealer Recommends

(Continued from page 19)

dependable help. And, it was also apparent that if such help was acquired, it would mean a heavy labor cost, additional office work, and more supervision.

"We are not featuring any special radio programs. Instead, our radio advertising is confined to spot announcements, those little messages that are slipped in between popular programs, and, consequently, are heard by a large

A Live Wire is no better than its Connections

DEAD END CLAMPS
for Aluminum Line

Catalog Nos. 6000 to 6004

Protects Aluminum Strands Against Crushing . . . Grips Steel Core Separately . . . Provides Bi-Metal Tap-Off Connector

Grip will withstand a tensile strain on the cable equal to its rated strength without injury to either the core or the aluminum strands. Easily attached. Capacity No. 4 to 4/0 Solid Core.

• WRITE FOR BULLETIN 12-A •

K&H KRUEGER & HUDEPOHL
Solderless Terminal Lugs and Connectors
VINE AT THIRD-ES . CINCINNATI, OHIO

number of people. Through this program, we are not only reaching our regular customers, but we are reaching thousands of others, and our business has increased accordingly.

"The same may be said for classified advertising. We can run announcements in the classified sections of the daily newspapers, and know that they will be read.

"How well we have profited through these mediums may be better determined from the fact that, where we formerly spent between $300 and $400 a month on radio spot announcements alone, we have now been able to reduce this to approximately $150. And the same may be said for classified advertising.

"What I consider more important than the combined returns from these two mediums, however, is a simple practice that any dealer can exercise, and with no cost to him whatsoever. That is: **know your customers.** Know their names, know where they live, know their likes and dislikes. Know what they have bought from you. Then, if Mrs. Jones calls up to tell you that her electric washer isn't acting just right, you can talk to her in an effective and constructive manner.

"This, I consider the greatest thing in the development of any business. All people, rich or poor, old or young, like to be known and to be recognized. They like to have you notice them, like to have you express an interest and appreciation for their business or home, or if that boy who went into the army a few months ago is making good. And, since it is through these people that we get the business which means our success or downfall, isn't it only right that we should show and express an interest in their welfare?

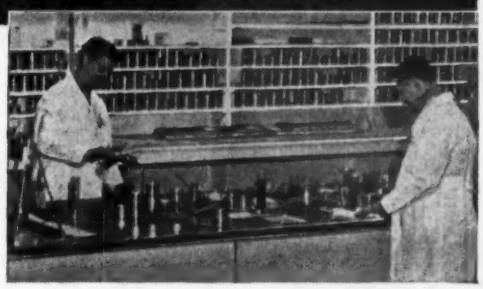
"I have been in business for 32 years. I started with a little repair shop, and have built up this business to its present position. I knew how to repair typewriters, but I had to learn about the mechanical refrigerator, the radio, and other modern home appliances. But I can now state that the time spent in acquiring this knowledge is one of the best investments ever made.

"If help is short, or the house is full of appliances to be repaired, many of these "rush," I can line up with the rest and do my share. If one of my best cus-

Higher Dielectric Strength—Longer Life

Can Be Built into Your Equipment

with *Pedigree* Electrical



INSULATING VARNISHES

Because of the accurate control of all production and strict adherence to carefully developed formulae, Pedigree varnishes are uniformly high in dielectric strength.

In addition, they provide resistance to oils, acids, alkali, and abrasion.

The PRODUCT with a PEDIGREE

The **P. D. GEORGE CO.**

5200 North Second Street • St. Louis, Missouri

Call In the Pedigree Varnish Man Nearest You.

"SURE! LADY, WE CAN FIX YOUR RANGE! WITH CHROMALOX HEATFLO"

THE REPLACEMENT RANGE UNIT THAT

Pleases customers • Cooks speedily • Cleans easily • Simplifies servicing • Fits all ranges, with clip-on adaptor rings • Cuts servicing costs • Cuts inventories.

Chromalox Super-Speed range units and parts available without priority—under WPB Order L-65.

EDWIN L. WIEGAND CO.

7600 Thomas Blvd., Pittsburgh 8, Pa.

Representatives

ATLANTA, GA.—C. B. Rogers, 1000 Peachtree St., N. E.
DALLAS, TEXAS—L. R. Ward, 403 Southland Bldg. Annex.
RALEIGH, N. C.—W. R. Phillips

Now you can walk on wires

FITTINGS FOR EVERY REQUIREMENT

QUICK, hurry-up, safe method of getting wires across floors for electric or telephone service. Walk on "Florduct" — run hand trucks over "Florduct" — mop over "Florduct."

It is applied directly to the floor surface. Wires are laid in and capping snapped on. Eliminates hazards of open wiring.

"Florduct" is made in two sizes, designed just large enough for the wires with no extra space. Painted a neutral gray finish with complete line of fittings to match. Listed and approved by Underwriters Laboratories, Inc.

National Electric
PRODUCTS CORPORATION
Pittsburgh, Pa.

tomers phones in that her refrigerator is not working just right, I can slip my tool kit into the car and go out and fix it myself.

"Stop and consider for a moment what this means. I don't have to make a flimsy excuse. I don't have to evade any issues, or make any dubious explanations. I can look at the appliance and know wherein lies the trouble. If you were the owner and the man who sold you the refrigerator—the man who owns the business—came out personally to find out the trouble, and then repaired it himself, wouldn't you have more confidence in him and the things he sold?

"I am not making these statements to boast. I am making them to stress the point that, today, the appliance dealer who stays in business has got to get out and look after the problems personally. The days when the dealer could sit back and reap the efforts of others are past.

"I have only a small staff, but we work together like a large family. If a difficult job comes in, we hold a little meeting, each offering suggestions as to what should be done. Then we put our ideas into action, and stay with the job until it is completed.

"We are facing the future with confidence, for we know from the many requests coming in every week for repair service that we are reaching the people with our messages of service; and we know from the many compliments that we have received on the work turned out that we are doing a good job. Consequently, when business is again restored to normal, and we have a good stock of merchandise on hand, we can go to those whom we have served with anticipation of some good sales."

It has often been stated that the most simple principles are the most powerful, and the experience of Mr. Beyer tends to prove this claim. In the face of curtailed production of merchandise, a shortage of manpower, increased costs of doing business, and many other problems, he has faced the situation with determination backed by good judgment; and how well he has succeeded may be determined by what he has accomplished. It is such men that form the nucleus of this great industry.

Capacitors Release Needed Capacity

(*Continued from page 21*)

tions of short duration. So far we have had no failures of capacitor units in this installation.

Though not our usual policy on smaller installations, the preliminary engineering on this particular bank included calculations to determine if any resonant conditions would result with respect to the fundamental and predominant harmonic frequencies due to the addition of the proposed amount of capacitive reactance to the existing circuit constants. Tests made after installation substantiated the conclusions made from our calculations that no serious resonant condition would result.

Although we now have approximately 36,600 kva of static capacitors installed on distribution feeders and substation busses over our system, we have described in detail the Rosemary Installation as we believe it shows clearly what can be accomplished by properly

Test Insulation the Modern Way
with a MODEL B-5
MEGOHMER

VARIOUS NEW MODELS AND RANGES

NEW BATTERY-VIBRATOR TYPE

No more tiresome cranking of a hand-driven generator . . . Entirely self-contained, steady test potential of 500 volts DC, available at the touch of a switch. Direct reading in insulation resistance

HERMAN H. STICHT CO., INC.
27 PARK PLACE NEW YORK, N. Y.

WRITE FOR BULLETIN No. 430

locating static capacitors in conjunction with automatic switching equipment. In this case, not only were urgently needed transmission line and generator capacity released, but a condition of inadequate voltage was eliminated and the installation of an additional 6900 volt feeder was made unnecessary, all with the use of a minimum amount of critical materials and at a cost of approximately $7.00 per capacitor kva.

Maintenance for The Arc Welder

(Continued from page 11)

All above field tests apply to the shunt welder coils and exciter fields. However, these methods do not work as well on the series field windings or the inner pole windings.

Usually, a ground test and visual inspection is all that is necessary on inner poles unless they have been reconnected for wrong polarity, this will be easily detected by severe arcing at the welder brushes under load. Open inner pole coils will cause "no voltage" at the welder output terminals. Shorted series fields will cause welder to have higher amperage than indicated on current scale of welder panel.

On machines using reactance coil and tapped resistance shunted across terminals of series winding, a short between any two taps will give a higher amperage than that indicated on panel. A short across entire resistance will give highest possible amperage. A shorted reactance makes it hard to "hold an arc."

Occasionally, a machine will "reverse polarity." This sometimes occurs when using large rod with amperage set low and voltage set low. There are other conditions, however, that will cause this trouble. On some occasions, more than one machine working on the same job with one or more machines working on opposite polarity from others with different voltage settings will cause this condition, especially if all electrical connections are not perfect. On machines that do not have a polarity reversing switch, the repairman may lift one exciter brush and apply current from a six-volt battery or any source of direct current, across the two brush holders. If the first trial does not reverse polarity, interchange the leads from the source of supply and apply current the second time.

The writer has endeavored to give a few points that may be of help to the repairman in the small shop, and if he is checked by his "peers" on some makeshift methods suggested, please remember that this is war and some of us may "patch a welder" that welds a plate on a battleship that sinks a "Nip ship" that has old "Tojo aboard"!

Wiring Accuracy With Q-Floors

(Continued from page 9)

that will be more than 12" away from the nearest point at which such service can be provided.

2. Either type of service can be supplied without cutting of structure and the sequels of patching and painting.

3. Except for labor and the floor top body, all cost of providing a service head is salvageable.

4. Not only can a simple tele-

TAYLOR FIBRE

TO MEET EVERY EXACTING JOB
TO KEEP YOUR CUSTOMERS SATISFIED

Specify **"TAYLOR"** *when you need*

Vulcanized Fibre Sheets
Vulcanized Fibre Rods
Vulcanized Fibre Tubing
Fibre Washers
Phenol Fibre Rods
Phenol Fibre Sheets
Phenol Fibre Tubing

For complete details see pages 8, 9, and 10 of the IWI BLUE CATALOG. If you do not have it, write today.

INSULATION AND WIRES IWI SERVICE

Distributed By
INSULATION and WIRES, Incorporated
2127 Pine Street, St. Louis, Missouri
289 Simpson Street, N. W., Atlanta, Georgia

YOU CAN DEPEND ON Sepco
1915 - 1944
ELECTRIC WATER HEATERS

ALTHOUGH WAR TIME CONSTRUCTED THEY STILL GIVE THEIR USUAL EFFICIENT, ECONOMICAL PERFORMANCE WITH THEIR LONG LIFE LOW WATTS DENSITY HEATING UNIT, THEIR POSITIVE SNAP ACTION THERMOSTAT AND MOST EFFICIENT HEAT INSULATION MANUFACTURED AND GUARANTEED BY

AUTOMATIC ELECTRIC HEATER CO.
POTTSTOWN, PENNA.

MAKE WIRE JOINTS
The Modern Way
IDEAL Wire-Nuts
Solderless, Tapeless Wire Connectors
Simply Strip Wires
Screw On!
UNRESTRICTED
Conserve Critical Materials—IDEAL "Wire-Nuts" use no Tin or Rubber. Meet all Government Requirements and are approved as alternate for solder-and-tape joints. Listed by Underwriters' Laboratories, Inc. Sizes for every job. FREE SAMPLES.
PROMPT DELIVERY
Sales Offices in All Principal Cities
IDEAL Sycamore
• IDEAL COMMUTATOR DRESSER CO •
1017 PARK AVE. SYCAMORE, ILL.

HELWIG SPEER
Carbon Products

Multiflex Brushes
Give
Better Commutation
Longer Life
Less Commutator Wear
That Extra Demand Required
Better All Around Performance
HELWIG COMPANY
2544 NORTH 30th ST., MILWAUKEE 10, WIS.
Southern Offices:
724 North Hudson, Oklahoma City, Oklahoma
Telephone: 3-3409
2005 McKinney Avenue, Houston 3, Texas
Telephone: Preston 1610

phone extension or a simple 110 volt convenience outlet be provided, it is equally simple to install at any selected point a PBX served by a 100 pair cable or an electric load requiring cables of large size. (The National Electrical Code permits the installation of conductors up to No. 0 and sizes larger by special permission.)

The truth of those claims has been amply demonstrated over and over again in this building during the process of locating tenants in 300,000 square feet of space and serving their needs. There are numerous examples of the installation of PBX's, one of which involves a feeder of 200 pairs, key cabinet equipment, and private intercommunicating equipment. There are examples of isolated heavy power loads. In no case has it been necessary to resort, in areas where the cellular floor was available, to raceways other than those inherent in the cell system. Here is a method of construction that will save building management many a headache.

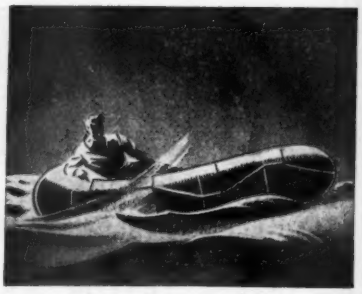
Energy is supplied to the Mercantile Bank Building by the local utility company through its underground network system, a transformer installation being located contiguous to the building under Ervay Street. From this vault two main services, metered at 120/208 volt, three-phase, four-wire, proceed to the power and lighting sections of the main switchboard, following a direct line across the sub-basement ceiling for a distance just under 100 feet.

The main switchboard is of the dead front type of construction, involving main knife switches of 3,000 ampere and 4,000 ampere capacity for lighting and power, respectively, and branch switches which in the smaller sizes are fusible from the front and which in the larger sizes are fusible from the rear. From this board radiate power and lighting feeders to load centers throughout the building. All areas are air conditioned.

One feature, unique in this section of the country at least, is that all tenants are metered on both power and lighting (except for such power as is involved in air conditioning) and billed for the energy used. The basis of billing as stated in the lease agreement is such that the cost to the tenant will be the same as if he were served and billed directly by the local utility.

Branch lighting panels on the office floors are of a flexible type that permit the grouping of any circuit or circuits with any other circuit or circuits for metering purposes. Each such panel is supplied with a total of eight sockets to receive detachable type watt-hour meters of either the two-wire or three-wire, 120/208 volt type, in sizes up to 50 amperes. If the space occupied by any single tenant exceeds the capacity of a single meter, more are supplied and their readings added for billing purposes.

Subox
ANTI-CORROSIVE PAINTS
favored for
TRANSMISSION
and
DISTRIBUTION DEPARTMENTS
MAINTENANCE
Subox, Inc.
NORTH ARLINGTON, N. J.



SOMEBODY TALKED!
Loose talk costs lives... Keep working ...Keep Mum.

hotel Lennox
St. Louis
Every room air-conditioned • Noiseproofed

Synthite INSULATING ENAMELS

Provide Extra Protection

These insulating enamels are applied over windings of armatures and stators previously treated with varnish to obtain greater resistance to acids, alkalies, chemical fumes, etc., under adverse conditions.

The advantage in using DOLPH'S Insulating Enamels is that they may be applied by brushing, dipping or spraying. Although air drying enamels, if given a slight bake, their resistance to acids and alkalies is greatly increased. The finish provided is very glossy and is also absolutely oil and waterproof.

Send for Folder on Insulating Enamels

Dolph's

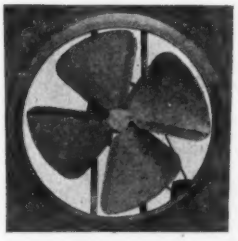
JOHN C. DOLPH COMPANY

Insulating Varnish Specialists

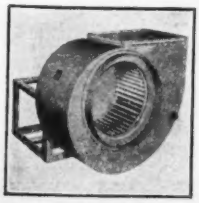
166 Emmet Street, Newark, New Jersey

THE "Fresh-Air MAKER"

provides fully the comfort and ventilation so essential in army barracks, mess halls, hospitals, headquarters, theaters and other military buildings. Its fine design and sound construction meet the specifications drawn for army fans and it is particularly adaptable to the various types of installations found in army buildings.



HY-DUTY BLOWERS



Single Inlet—Double Inlet. 400 CFM to 12,500 CFM.

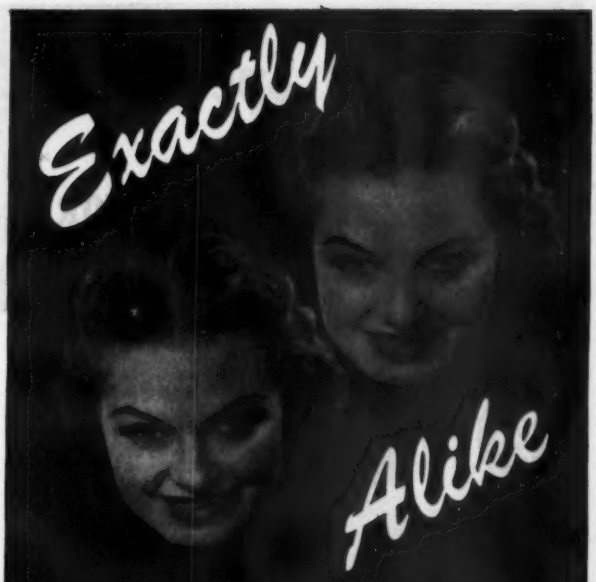
Single Inlet Blower illustrated at left is particularly adapted for ventilation of mess halls in military establishments.

BLOWER DIVISION

SCHWITZER-CUMMINS COMPANY

1145 EAST 22ND STREET INDIANAPOLIS, U. S. A.

Exactly Alike



BUT what a difference ... when you know them!

All starters look alike but that's where likeness ends.

LLOYD STARTERS

- are assembled by skilled workers, trained to Lloyd standards.
- are checked and rechecked in the Lloyd factory and laboratory.
- are constantly checked and approved by nationally known laboratories.
- are superior in quality . . . in performance . . . in length of life.

Pat Nos 2200443 2228210

LLOYD POLICY INSURES QUALITY

Lloyd Starters Are Listed and Approved by Underwriters' Laboratories Inc. Canadian Engineering Standards Assoc.

Certified by Electrical Testing Laboratory - Spec. 6

Certified to Fleur-O-Lier Standards

LLOYD PRODUCTS CO.

PROVIDENCE 5, R. I.

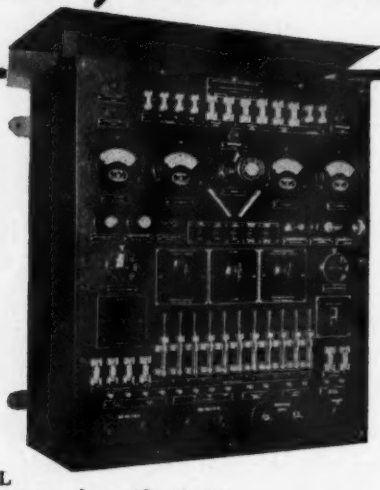
Representatives in 23 Leading Cities

Export Office: 13 E. 40th St., New York, N. Y.

Electrical Specialties

of Every Type

Including MARINE WORK



WORK TEST PANEL
—built to customers' specifications and Navy standards.

RADIO MOTOR-GENERATOR and SELECTOR CONTROL PANEL
—built to customers' specifications for any number of circuits.

ALL types of electrical specialties, boxes, cabinets, control panels, duct-work, etc., manufactured by an organization accustomed to meeting exacting Army, Navy and Commercial specifications. Full engineering personnel and equipment for manufacture of special electrical items to customers' needs in addition to all standard articles. Let us quote you on your requirements. Write for illustrated catalog.

JACKSONVILLE METAL MANUFACTURING COMPANY

247 Riverside Avenue, Jacksonville, Florida

Index of ADVERTISERS

A
Adam Electric Co., Frank 6
Aluminum Company of America 39
American Blower Corp. 2
American Coolair Corp. 5
Anaconda Wire & Cable Co., Inc. 4
Automatic Electric Heater Co., Inc. 69

B
Briegel Method Tool Co. ..... *
Bryant Electric Co. 59
Bull Dog Electric Products Co. 61
Burndy Engineering Co., Inc. ..... *

C
Clark Water Heater Division ..... *
Crescent Insulated Wire & Cable Co. 55
Curtis Lighting, Inc. ..... *

D
Dolph Co., John C. 71

E
Edison General Electric Appliance Co. ..... *
Electric Vacuum Cleaner Co., Inc. 61

F
Federal Electric Products Co., Inc. 47
Frigidaire Division 49

G
General Electric Co. (Appliances) ..... 32 and 33
General Electric Co. (Flamenol) 62
General Electric Co. (Insulating Varnish) 66
General Electric Co. (Lamps) ..... *
General Electric Co. (Wiring Materials) ..... Back Cover
George Co., P. D. 67
Graybar Electric Co. ..... *
Greenlee Tool Co. ..... *

H
Hazard Insulated Wire Works 1
Helwig Company 70
Holdenline Company 67
Hotel Lennox 70
Hotel Mayfair ..... *
Hub Electric Co. 64
Hubbard & Company 9
Hunter Fan & Ventilating Co., Inc. ..... Front Cover

I
Ideal Commutator Dresser Co. 70
Insulation & Wires, Inc. 69

J
Jacksonville Metal Mfg. Co. 73
Johns-Manville ..... *

K
Kelvinator Division ..... 44 and 45
Kreuger & Hudepohl 60

L
Landers, Frary & Clark ..... *
Lloyd Products Co. 71

M
McGraw Electric Co. ..... *
Mitchell Mfg. Co. 69

N
National Electric Products Corp. 68
National Varnished Products Corp. ..... *
Norge Division ..... *

O
Okonite Company 3

P
Paragon Electric Co. 65
Penn-Union Electric Corp. 64
Premier Division 65
Proctor Electric Co. Division ..... *

R
Robbins & Myers, Inc. ..... *
Schwitzer-Cummins Co. 73

S
Square D. Company ..... Inside Back Cover
Sticht Co., Inc., Herman A. 60
Subox, Inc. 70
Sylvania Electric Products, Inc. ..... 50 and 51

T
Thomas & Betts Co., Inc. 63

U
United States Rubber Co., Inc. (Tape Division) 72
United States Rubber Co. (Wire Division) ..... *

W
Walker Brothers ..... *
Ward Leonard Electric Co. ..... *
Westinghouse Electric & Mfg. Co. (Apparatus) ..... Inside Front Cover
Westinghouse Electric & Mfg. Co. (Appliances) 41
Westinghouse Electric & Mfg. Co. (General) 59
Westinghouse Electric & Mfg. Co. (Lamps) ..... *
Weston Electrical Instrument Corp. ..... *
Wiegand Co., Edwin L. 58
Wiremold Company ..... *

Y
Youngstown Sheet & Tube Co. 57